INDUSTRIAL ENCYCLOPÆDIA FOR INDIA

AND

TECHNO-CHEMICAL DIRECTORY

Edited by

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Formerly Editor of Commerce and Industry, How to Grow Riches, Employment for Millions, Letter-writing Made Easy, Industrial and Other Openings for Youngmen, Editor, Gleanings and Great Thoughts, etc., etc.

5 PARTS BOUND TOGETHER:

PART I: Priceless Trade Secrets and Recepes
PART II: Valuable Tables
PART III: Indispensable Information
PART IV: Techno-Chemical Directory & Glossary of Indigenous Drugs
PART V: Equivalents of Indigenous Drugs etc., in English.

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DEDICATION

This volume is dedicated to all my devoted and beloved children :

1. Sushila Devi (Married Major Divan Jermani Das, O.B.E.) Formerly, Minister of Agriculture and then Military Secretary, Patiala State.
2. Shakuntala Devi (Married Mr. Jiwa Ram, B.A., B.T.)
3. Maharaj Krishen, B.A., General Manager, Seksaria Trading Co., Ltd., Bombay and Delhi.
4. R. D. Malhotra, Manager, Jamuna Hosiery Mills, Delhi.
5. Sudarshan, B.A.
6. Suniti Devi.
7. Swarnalata

AND

To all other patriotic Indians in the fields of Industry, Trade and Commerce,

AND

To Science Masters, Professors of Science and Technical Instructors.

PREFACE

THE present edition is a great amplification and rearrangement of the Second edition. Matter in many sections has alphabetically been arranged, hundreds of formulæ and processes and numerous useful and indispensable tables have been added Great pains have been taken in amplifying the IV and V parts, the IV part being the head and front of the present volume. The reader of this Encyclopædia shall have not to hunt in often inaccessible technical libraries, for elucidation of technical terms and for manufacturing hints of the chemicals that can be easily made at home. Let him dip into the Techno-Chemical Directory (Part IV) and most of his difficulties will automatically disappear. Vernacular mames of most of the drugs have been given but of course not in all the cases as we Indians have slavishly been borrowing technical terms wholesale from the west, only here and there mutilating them. As a nation tending to be free either the mutilations should be thorough or new words should be coined ; all honour to them who do the spade-work.

The addition of quite a number of new formulæ brings within the range of the readers many high priced secrets which can form the bases of many fortunes, made doubly possible by the Second Great World War giving a great impetus to the demand for indigenous manufacturers. It has been brought home to the Government that the British Empire cannot carry on war without the active co-operation of India, willing if you please, but unwilling if India be dragged into the war as it has been done systematically here-to-fore and that therefore the industries of India must be developed to the highest pitch so that when the west is cut off during a global war, India must be able to supply all the consumer's goods that we need. Then there would be less possibility of black markets that suck up the blood of the middle classes. India can be, rather should be and ought to be, self-contained ; the people must be, by sweet persuasion if you please, but by force with the incoming of Swaraj, made to give up the craze for the showy manufacturs of the west and even of Japan. The more we patronize them, the greater is the drainage of hard-earned wealth of India and the less are our savings, not in currency notes but in genuine gold and silver, the less provided and the more discouraged are the Indian manufacturers, and the longer is our slavery to the west, especially to England that has during almost a century pompously posed as the TRUSTEE of INDIA, as if the trust is most honourably discharged by crippling the industries of her ward or at any rate playing the obstructionist. *India has had bitter and rankling feelings of this trust and now cries, 'Save us, O God, from this kind of trust' Through the decades that have gone by it has been the earnest endeavour of the English capitalists to bring to bear upon the Whitehall the maximum possible pressure to thwart the Indian industrialists to come into their own. The present war has, however, proved a great blessing ; a great eye-opener as much to the Government as to the people of India who have had to suffer endless privations that no longer should she patronise foreign countries where she possibly can ; India must stand on her own legs ; and as such

BUY INDIAN should be our perpetual slogan. BUY INDIAN

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* The embarassment caused to the budding industries of India by Empire Dollar Pool and Empire Sterling Pool is a case in point.

should be on the lips of everybody in the street. BUY INDIAN should ring and reverberate from every educated tongue. BUY INDIAN should be painted on every road and emblazoned on every wall. BUY INDIAN should be the test by which the candidates should be measured in the various election compaigns: their worth should be judged by how far they can further the cause of BUY INDIAN. The necessity of BUY INDIAN should be sunk deep into the hearts of the Indian ladies, for they have and they may still prove a stumbling block in the way of the Swadeshi movement. Their craze for fine goods from the West is unnatural and unpatriotic, it perpetuates our slavery. They should wait for such goods for five years or so till we can produce them in India. The Russian example of wise and partiotic planning is before us. Contractors, capitalists and corrupt officers who have made money while the Mars was in the ascendent and the war was in full swing must be prevailed upon to subsidise the projected BUY INDIAN campaign, look askance though the world may at forcing the public leeches to disgorge themselves. On the success of this campaign depends the early advent of Swaraj. We should buy from the West in our mutual interest and not to deprive the children of the soil of the much needed chance to labour and to feed the hungry mouths of their dependants. No longer should India be tied to the apron strings of Europe, much less to those of England Not England but Russia should serve as a model for our industrial progress. Any industrial planning of India in which England has a determining voice has to be accepted with a pair of tongs, that kind of planning can never lead to the Mecca of our hopes.

The year 1943 saw an unprecedented demand for the second edition of the Encyclopædia. Within four months the present publishers sold 600 copies at the usual price while other booksellers who had purchased copies earlier sold away even soiled copies at double the price. The present edition which is almost double hopes to be greatly appreciated and to create for itself still wider and quicker demand. Money spent in buying a copy of this Encyclopædia is like sowing the seeds at the proper time that brings in the fullness of time a bumper harvest. To all well-to-do householders and to all institutions most of the formulæ and processes will prove friends in need and friends indeed, especially those given in the chapters on Beverages (IV), Bleaching and Dyeing (VI) Household Requisites (XI), Insecticides and Vermin-Killers (XIII), Shoe polishes (XIV), Toilet Preparations (XV), Office Appliances (XVII), Secrets of Patent Medicines (XX), Pharmaceutical Preparations (XXI) and Miscellaneous (XXVII). So every head of a family will do well to keep a copy handy.

Partly on account of the control imposed by the Government on the use cf paper and partly because of some difficulties in the press, the presnt edition has taken almost twenty-two months to come out of the press after the MSS. were handed over to the Publishers. Authors, excluding the War Propagandists, are the first and the worst sufferers while the war fever is on. But all is well that ends well. If this war bring sense to the war lords and everlasting peace to the world, it shall not have been fought in vain. But . . . . . .

S. D.

PREFACE TO THE SECOND EDITION

THE hearty welcome accorded to the first edition of Industrial Encyclopædia of India is a proof positive of its usefulness. Since then much water has flown under the bridge and India has had to pass through a series of kaleidoscopic changes. The hideous monster of UNEMPLOYMENT has assumed a most threatening and ominous shape. Three crores or more of hungry mouths have been added to the teeming millions of India, intensifying the problem of bread winning to a degree unparalleled in the economic history of India. The aftermath of the Great World War has at last begun to tell upon the daily life of the masses in a most virulent form, and if the present conditions persist for a long time, the cup of misery of the middle classes, the driving power of every nation, will be full to the brim, and no wonder that if no relief be afforded to them, they may be gradually wiped out of existence, leaving the capitalists and the labourers to fight their battles in different theatres of war.

Times have come when the capitalists, the big moneyed men, must understand that without a prosperous and large middle class they cannot for ever and ever maintain their present *status quo*. Unless there may be a numerous middle class, there would be no demand for the fancy manufactures of which there is so large a mass production. Most of their machines will be lying idle. The prosperity of the capitalists, big moneyed men, is indissolubly bound up with the increasing prosperity of an extensive middle class the safety buffer between the capitalists who would exploit the labour and the labourers who without the healthy influence of the middle classes would tear the capitalists to pieces. It must therefore, be the earnest endeavour of all right-thinking and level-headed people to save the middle classes from going to rack and ruin.

The middle classes in India have up to this time been relying on the false, untrustworthy and frail crutches of service. Even now after thousands upon thousands of able-bodied and willing-to-work educated youngmen have been thrown out of unemployment and are sitting idle in remote villages, they are still waiting for an unexpected boom* when they should get back into service. Born and bred up in a servile atmosphere, they could not escape cultivating a servile mentality. Their mind runs in grooves. Overmuch dependence on their masters and reliance on a steady salary month after month has robbed them of initiative and enterprise, and they would not allow even their sons and wards to get out of the oft-trodden tracks. The merchants and traders, too, have been plying their business in a traditional fashion More and more rivals have been added to the market and the competition among them has been growing keener and keener, till their margin of profit has been reduced to the minimum. The educated and wiser section among them keeping abreast with the times has at last begun to take better and more intelligent interest in new industries and they are slowly beginning to become alive to the fact that the ultimate salvation of India lies in the progress in industries.

No industry would, however, go on paying uniformly unless it may

* This boom did come during the Second World War that absorbed almost all educated men in Government services. But after that what?

from time to time recreate itself. The old order must change and yield place to new, lest one good custom should corrupt the world, as Tennyson puts it. Stagnation in any line becomes in due course unremunerative for the simple reason that it brings in a whole host of competitors. What is most needed, therefore, to keep an industry always paying is to use brains on it and to find out ways and means as much to improve it as to find new markets and new buyers for the consumption of its products. If the reader is ready to bring these qualifications to bear upon his task, he would all the more profit himself by making use of the processes and the money-making ideas elaborated in the pages of this modest volume. The collection of materials extends over fourteen† long years. Fullest use has been made of *Industry, Calcutta ; Practical Medicine, Delhi ;* many periodicals and a whole host of other valuable literature.

TO BUDDING INDUSTRIALIST

The budding industrialist must look upon the processes given in this volume as so many starting points, as so many finger-posts, rather than a series of mile-stones. It was impossible to bring within the compass of this volume the varied information that is available on each subject. *The reader having decided to start a particular industry must try for himself the accuracy of the processes* and find out if the local and other conditions can permit him to make it paying. Of course it is no use of trying to squeeze blood out of turnips. When he is satisfied on these points, he should proceed boldly and show his enterprise in risking some capital. All Hamlet-like study of books on industry but no enterprise will land you nowhere but on the barren island of Alnascher, the Sheikhchilli of the Arabian Nights. The glittering gold coins well-preserved in velvet purses will never germinate, never sprout, never grow and never yield fruit. The seeds must first lose their existence in the dim habitats of the sub-soil before you can expect any yield, any corn. Often unfavourable circumstances will not allow the seeds to strike root, but overmuch craven and knock-kneed feelings over this scare may obstruct the path of progress altogether. Were farmers to surrender to these feelings, there would be almost an end of all agriculture. The agriculturist has from year to year to run risks. Same should be the case with industrialists. They must all study the life of Palissy the Potter. In search of glazes he had to meet failure after failure till at last he succeeded. The collective embodiment of patience, perseverance, enterprise, the boldness and pluck to take advantage of the golden opportunities as they arise, the will-to-achieve, and the quality of never-say-fail ought to be the pole-star of every industrialist. Difficulties shall arise in his path, but he must surmount them rather than surrender to them. The greater the risks run, the greater the glory gained. No pains, no gains. As the competitive strife becomes keener, the world shall have no place for weakly sentimental carpet knights.

HASTEN SLOWLY

It is physically impossible for the author of a book of this nature to try all the formulae and processes ; all that he can do is to try a few pro-

† Now quite quarter of a century.

cesses here and there. For the rest he has to use the mental balance of probabilities, and to reject the unlikely and to incorporate the likely formulas. It is, therefore, of the utmost importance that trial experiments must be made before undertaking a manufacture on a large scale and before launching a selling campaign.

To understand the reason why of most of the chemicals employed in most of the processes and to know their vernacular equivalents, every reader must provide himself with a copy of the INDUSTRIAL AND TECHNICAL DIRECTORY the supplementary volume to Industrial Encyclopædia.‡ It will throw a flood of light on most of the obscure points and so facilitate the manufacture of articles Often this additional knowledge will be a stepping-stone to higher flights, flights that may give glimpses of yet unexplored regions.

THE COMMERCIAL VALUE OF MANUFACTURES

Before placing a manufacture on the market, calculations must be made to find out if by using a particular method or process, a reasonable profit can be made Some of the formulae or processes are meant only for the laboratory but otherwise have no commercial value. Thus hydrogen for filling the baloons may be made by electrolysis of water or by the action of dilute sulphuric acid on commercial zinc The former will be much too expensive, while the latter is quite cheap. The articles must be bought in the cheapest market ¶ Aim at cheapness but not at the expense of quality The cost of production and distribution should be reduced to the minimum. In the beginning both may be a little higher, but as experience in a particular line develops, the working expenses can be reduced.

PREFACE TO THE FIRST EDITION

In the compilation of this volume we have been considerably at pains to choose only those plans or processes that can be easily worked out by a man of ordinary intelligence and commonsense with a small outlay of capital with a view to turn out just those articles that can find a ready market anywhere. Of course, the sale will depend upon the measure of enthusiasm, effort, and enterprise put in. The great secret of success in this world is to push, pull and get on ; to try ceaselessly ; to work like the busy ant ; to take time by the forelock and capture the trade, commerce and industries that are at the present time in the hands of the foreigners. Again we have specially borne in mind the necessities of School Offices and of Science Teachers who if they mind the interests of their pupils can with the help of the materials at their disposal in the laboratories try a good many processes with the two-fold object of interesting the science students in indigenous industries and of ultimately adding to their own income by starting their work independently. If a few science teachers should walk out of the oft-trodden rut of routine work our efforts shall have been amply recompensed.

‡ In the present edition it forms IV Part of the volume.

¶ He who would not be cheated must make enquiries at three shops is a Chinese proverb of great value to industrialists that aim at mass production.

A book of processes can be of no earthly use even to the science graduates or the Science Teachers, let alone the Indian laymen, if it does not contain Hindustani equivalents of the various English chemicals, plants, etc., with which even the average Englishman is unfamiliar, and the meanings of which in the common dictionaries can in no way be helpful. We have, therefore, appended with this volume an elaborate glossary giving Hindustani equivalents of most terms, with brief description of the preparation of many chemicals of every day use. (*See Parts IV and V*)

See also Note on Toys p. 243.

CONTENTS

(Frequently consult the Index and the Directory, Part IV. Numerals in black type indicate pages.)

PART I

PRICELESS TRADE SECRETS RECIPES & FORMULAS

In using this work, make free use of the "Techno-Chemical Directory," Part IV, and Index at the end.

When simply a numeral figure is added to a drug, chemical or ingredient, it implies, take such and such thing so many parts.

PLAY THE GAME.

Perseverance is the Keynote to Industry.—It is owing to this virtue that the Germans and more so now the Japanese have beaten all other nations in the Industrial World. In order to find out the accuracy of a particular experiment, Prof. Weber is said to have repeated 23,000 times a certain process. Experiment on a small scale; the smaller the better.

Formulas quoted are approximations to ideas formulas and should be used as a basis of experimental each case requiring some modifications. The product, obtained should not be compared with articles manufactured by well-known makers whose secret processes probably cost them thousands of pounds or like Atomic Bomb even billions of dollars. Want of experience, and lack of necessary plant, can be obviated only by expenditure of time and money.

CHAPTER I

SCIENTIFIC AGRICULTURE & ALLIED TRADES

SECTION I.

THE REASON WHY

It is the besetting sin of all Indian trades and industries that they have been plied since times immemorial by people of limited means and limited knowledge who have made little or no progress. *Manu* lays down in his famous Code that Agriculture and all other industries requiring hard labour should be plied by the *Shudras* and that the twice-born should have nothing to do with them. This accounts for our backwardness in agriculture and all other industries. In times gone by when there were no rapid means of communication, our wants were few and they were easily supplied. But now in this age of steamships and locomotive engines, they alone rule over the world who produce more with less labour. India no longer enjoys the proud privilege of being the granary of the British Empire. Australia and Canada have entered into the competition and with their scientific agriculture are beating India on her own ground. But for the import duty on wheat imposed by the Government wheat should sell at rupee one eight a maund, and the poor farmers would go to the wall. It is, therefore, all the more necessary for the Indians that they should devote more and more attention to this much neglected subject, more so because even in these days of great depression when corn sells so very cheaply, investments made in land yield not more than one per cent per annum on the outlay.* True, the Land Alienation Act stands in the way; all the same the aspirants can have fields on lease. Land can also be acquired for gardening purposes by the non-agriculturists. After conducting experiments with the processes given in this chapter, one can enter into contract with honest farmers to have so much of the yield in case the corn

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* This may not be temporarily true when owing to miscontrol of prices by the Government during the Second World War the prices of corn have risen so fabulously high as to have brought about India-wide famine in spite of bumper harvests.

produced with the help of such and such manure is so much more than the ordinary harvest†.* This should prove in the long run an excellent trade, especially for those who deal with the farmers.

So as to use the processes and formulas given in this chapter to the best advantage, it will be necessary for the reader to understand some of the underlying principles of scientific agriculture.

All animals, including man, the roof and crown of all creation, draw the elements of their blood from the vegetable world. Vegetables also draw the same constituents from the earth and air as are necessary for building up the tissues of the animals. Elements are of two kinds—organic and inorganic. The organic substances contain carbon, nitrogen, oxygen, etc., while the inorganic compounds necessary for the animals must contain some of the elements such as sulphur, phosphorus, iron, soda, potash, manganese, lime, alumina, and silica. Plants derive the inorganic matter from the soil. They either build up the organic matters themselves or get them from the soil or air. Should man go on cultivating the soil and plants go on deriving their food, organic and inorganic, from the soil, it would be soon exhausted and become barren and desolate. Man and Nature, however, both come to the help of the impoverished soil. They restore to the soil what the plants take away. Rain brings down ammonia, nitric acid, and nitrogen and carbon dioxide dissolved in it. It also dilutes the minerals already present in the soil, which in their liquid form are readily sucked up by the roots of the plants. Animals after using up the necessary parts of the plant foods throw away the refuse and send it back to the fields. Myriads of insects and bacteria then try their level best to reduce this manure to the finest state and change it into nitrogenous form. Thus the white ants serve as reducing insects. Different kinds of cereals require different kinds of organic and inorganic substances in varying forms and proportions. Were the same corn be sown year after year, the soil would be soon exhausted, for certain elements would be removed altogether, or almost

* At the time of the 3rd edition going to the press, the Government has in a limited way embarked upon such a campaign.

altogether, but experience has taught man to have a rotation of crops, so that in the interval between two crops of wheat or two crops of Indian corn, the soil should manage to get the necessary elements from the air and from other sources.

Plants and animals are complementary and inter-dependent. Plants are necessary for the life of the animals and animals are in their turn as much necessary for the life of the plants. Plants supply us carbohydrates, *e.g.*, sugars, starches; hydrocarbons, *i.e.*, all sorts of oils extracted from the vegetable seeds; and proteins or nitrogenous substances, *i.e.*, the flesh forming foods: *e.g.*, peas, beans, parts of wheat, Indian corn, pulses, etc. Animals supply to the plants carbon dioxide breathed out of their lungs, urates and oxalates, ammonia, etc., in the form of urine and excreta. Their dead bodies, the ashes of burnt bodies, and the ashes of wood and plants bring back to the soil all the minerals which the animals at one time or other happened to have taken away from the soil in the form of fruits or vegetables or even leaves.

During the daytime the plants purify the air for us. In the presence of strong sunlight they suck up carbon dioxide and retain carbon for building up their tissues. They set free pure oxygen for the respiration of the animals. The animals in their turn all the twenty-four hours of the day go on breathing in air, from which the lungs suck up oxygen for purifying their blood and breathe out carbon dioxide for the plants. At night the plants, too, instead of breathing in carbon dioxide breathe out or rather vomit excess amount of carbon dioxide. Thus the popular belief that one should not go in the neighbourhood of trees at night is based on scientific facts. So that the atmosphere may not be reloaded with too much of carbon dioxide, nature deposits dew on the leaves, the lungs of the plants. The quantity of dew is increased by what is known as *transpiration*, the giving out of the moisture by the plants. Both of these actions tend to absorb the excess of carbon dioxide given out by the plants at night.

It has been proved that no organic substance can

be absorbed by a plant until it has undergone the process of decay, by which its constituents are changed into ammonia, water and carbonic acid. These too will not be accepted by the plants unless the soil can furnish phosphate of lime, silica, potash, soda and magnesia. Without these substances even carbonic acid, ammonia, and water would be worse than useless, rather they may be fatal to the life of plants. The large amount of carbon which the plants can yield in the form of wood is derived chiefly from the air. This is true even on the high hills. Winds distribute carbon dioxide evenly everywhere. Some proportion is also received from the soil and rain water.

"The ashes of wheat-straw contain much *silica* and potash, whilst the ashes of the seeds contain *phosphate of ammonia* and *magnesia*. Hence if a soil be deficient in any one of them, it will not yield wheat. On the other hand a good crop of wheat will exhaust the soil of these substances, and it will not yield a second crop till they have been restored either by manuring or by the gradual action of the weather in disintegrating the subsoil. Hence, the benefit derived from fallows and from the rotation of the crops."

If by an extraordinary supply of any manure a very rich crop has been obtained, the same soil may refuse to yield a second big crop, for the first crop tends to exhaust the soil of many other minerals also. Hence by chemical analysis by soil analysts it must be found out which chemicals go to compose the ashes of the different parts of a certain plant, and which chemicals are to be met with in the soil in which that plant grows luxuriantly. By enriching the soil just with these chemicals in the form of manures, bumper harvests may be expected, the weather-complex remaining normal.

SUCCESSFUL AGRICULTURE

For successful agriculture, five principles must be kept in view. 1. By examining the ashes of a thriving plant, we must find out which minerals go to compose the tissues of a plant. 2. The soil must be examined to find out if those elements are present there in abundance. 3. When a soil is found deficient in these

minerals, the same must be supplied from outside. 4. The leaves,straw, etc., of the plant are the best manure, chiefly because every plant extracts from the soil just those elements which are most necessary for it. In our country the straw of wheat is used for fodder for the cattle. The excreta of these animals added to the soil bring back to the soil what had been taken away from it. It has been proved by experiments that when wheat straw is added as manure there is a bumper harvest of wheat; when clippings of vine are added as manure, the vine yields more of grapes. Similarly the manure of fruit trees or flower plants, leaves in decayed form, make excellent manure for fruit trees and flowering plants. 5. In the rotation of crops, those should follow which require different minerals. Thus a crop of peas which requires little or no minerals should come after one which impoverishes the soil of its potash and phosphates.

SECTION II

ARTIFICIAL MANURES

To get the most from land it is most essential that the cultivator should use artificial manures. The most important of them is *guano*, from a Peruvian word *huanho*, which means dung. This was originally imported from the shores of Peru, where large deposits were found. Quantities more or less considerable were also received from Labrador, West Indies, Australia, Chili, Patagonia Bolivia, Cape of Good Hope, etc. Guano is composed of decomposed bodies and changed bodies of sea-fowl mixed with dried urine and excreta. It contains large amount of phosphates or nitrogen according to the quality imported, Peruvian guano being the most nitrogenous. It has been estimated that Peru could export 150,000,000 tons of this manure maximally. Peruvian guano contains a large amount of soluble matters like salts of ammonia, potash and soda. Peruvian guano is more valuable than manures of similar type imported from other countries because on account of comparatively dry climate prevailing in the Chincha Islands the soluble matter has not been washed away by the heavy rains prevailing else-

Agricultural Review as shown by two analyses is as follows :—

	No. 1	No. 2
Sal ammoniac (*naushadar*)	2·25	6·500
Urate of ammonia (a product from urine)	12·20	3·244
Oxalate of ammonia	17 73	13·351
Phosphate of ammonia	6·90	6·250
Carbonate of ammonia	·80	..
Humate of ammonia	1·06	..
Waxy matter	0·75	0·600
Ammoniaco-phosphate of magnesia	11·63	4·196
Phosphate of lime	20·16	9·940
Oxalate of lime	1·30	16·300
Carbonate of lime	1·65	..
Chloride of sodium (common salt)	0·40	0·100
Sulphate of soda	4·92	1·119
Phosphate of soda	..	5·291
Sulphate of potash	4·00	4·227
Alumina	..	0·104
Sand	1·68	..
Water	4·31	..
Undetermined organic matter	8·26	22·718
Residue insoluble in nitric acid	..	5·800
	100·00	100·000

From the above analyses it will be seen that the genuine Peruvian guano contains on the average, 20 per cent of phosphate of lime, 8 per cent of alkaline salts and organic matter and ammoniacal salts capable of yielding 16 per cent of ammonia.

Attempts have been made to manufacture guano by mixing the above ingredients in various proportions. Some of these constituents can be had very cheaply. Attempts must be made in India to make use of the large amounts of urates, phosphates, oxalates, and ammoniacal salts run to waste now-a-days in dairies and *goshalas*. Indeed the *goshalas* which are being run on very uneconomical lines in these days and are a sort of mere burden on the Hindu population can be made more, or less self-supporting if one could enter into contract with the *goshalas* for the dung and urine of the cattle and mix them with other ingredients which are found wanting for a certain crop. The manufac-

ture of artificial manures forms a very paying industry in the West. Young men in search of untrodden fields of commerce and manufactures must study this subject at greater length and set up as Manure Specialists in agricultural centres. The various Agricultural Colleges in India will do well to start fortnight courses for the benefit of small capitalists.

SOME VERY USEFUL MANURES

India being largely an agricultural country (80% of Indians live in villages) people in rural areas instead of taking to urban professions or clerkship in dusty, smoky, unhealthy, and congested towns, will do well to raise the productivity of the land by advertising the following manures in chosen rural centres. These depots for the sale of manures and fertilisers should prove to be very paying if opened in small towns or markets.

(1) *A cheap fertiliser.*—Sulphate of ammonia, 30 seers; nitrate of soda, 20 seers; bone-ash, 125 seers; plaster of Paris, 125 seers; salt, ½ bushel (1 bushel = 2150·42 cubic in); wood ashes, 3 bushels; horse litter and urine, 20 bushels. Sold in America at Rs. 50 per ton.

(2) *For Corn, Turnips, or Grass.*—Crude potash, 7 seers; common salt, 28 seers; bone dust, 56 seers; gypsum or plaster of Paris, 56 seers; wood ashes, 16 bushels.

(3) *For Corn.*—To produce 40 maunds more in an acre, use 3 seers of ammonium sulphate per acre. *For tobacco,* use 2 maunds (yield 81 maunds more per acre). *For Potatoes,* 11 lbs. (yield 80 maunds more per acre).

(4) *For Turnips.*—Mix salt, 100, with lime, 300. Allow the mixture to lie for a few months. Sprinkle in furrows when sowing the seeds. *For vegetable gardens,* peat waste, 300; lime, 30; powdered brick, 30; wood ashes, 30; salt, 2; shavings of horn, 36; dead leaves, 45. If taken in lbs. the above will suffice 250 sq. yds. Shavings of horn can be had cheaply from cutlery and comb makers.

MANURES FROM WASTE PRODUCTS

From Urine.—Mix urine with hydrochlorate of magnesia. A considerable precipitate of ammonia and

magnesia is formed in a month. Separate the precipitate from the fluid and dry. *Used for oranges and vegetables.*

From Bone Dust.—Bone dust, 350; alum, 97; pearl-ash, 19 (or woodash, 78); salt, 78; dry Glauber's salt (sodium sulphate), 19; crude magnesium sulphate, 40. *Used for flowers.* See Bone Ash, infra.

From Coal Ashes.—Put 1 part of quicklime in the centre of 103 parts of ashes till it is slaked. After 12 hours, mix well and keep in a dry place. Used for strewing on lawns to prevent growth of moss and to promote that of grass. *Keeps away sand flies and snails.*

From Blood (obtained from slaughter-houses). Mix plaster of Paris (gypsum), 20; calcined sulphate of soda, 12; blood, 100. Put in a large boiler and add sulphuric acid, 5; at 600 % in small proportions. Heat. The spongy mass so obtained is powdered. *Used for grapes.**

ON STORAGE OF CATTLE URINE AND DUNG

Since times immemorial farmers in all parts of the world have used dung and litter for manuring the land, *i.e.*, in restoring to the soil most of the rich salts which the crops take away. The way in which these manures are used in these days in India is open to two objections. The storage of dung is uneconomical. It must be stored in pits, otherwise it is liable to dry and lose much of its fertilising value for the simple reason that desiccation or dryness kills the bacteria that are helpful in reducing the dung. The farmers not infrequently store the dung just near their own houses or at best just outside the village. This practice gives rise to most offensive smell and the villages which otherwise ought to put on nice and pleasant look appear ugly and unsightly. In the second place no effort is made anywhere to make use of the urine of animals although it is rich in nitrates. Of course the urine of milch cows does not contain as much of nitrates as that of non-milch cattle, all the same the farmers ought to make use of the cattle urine. For this purpose, the farmers ought to have a separate cattle stall, floor of which

* Manures for other crops can be quoted on an application being made to the author through the Publishers of this volume.

should be inclined toward a cess-pool, or better still a whole village ought to have a separate cattle-stall which should be provided with a big cess-pool or reservoir for urine. The urine can then be emptied into carts and distributed in rotation according to the number of cattle a farmer owns. It will pay any aspirant to ally himself with any big landlord or village headman who should provide a big house or a number of houses for tethering in the non-milch cattle. Arrangements, should then be made to collect the urine as hinted above, and *manure from urine* prepared according to the formulas given above. Properly used rich crops of vegetables may be obtained.

CHAPTER II

AGRICULTURAL PRODUCTS

POTATO

POTATO like tobacco and one another species of the same order was originally grown in America, from where it was introduced by Raleigh in England in 1584. At first there was great prejudice against its use, the crop being fed to the cattle and pigs. Prejudice was slowly killed, and now potato is one of the most widely cultivated of plants, grown not only for food, but also for making starch (which see), brandy, paste, potato-flour and sugar. Potato starch on fermentation is turned into alcohol. The sugar in sweet potatoes (*shakkar-qandi*) is developed by baking or roasting.

Potato is grown from the tubers; the true seed from the flowers not yielding good potatoes for two or three years, when excellent varieties calculated to fetch fancy prices can be produced. The variety sown in September is harvested in January; that in February in May. For the latter crop the Farukhabad or Quetta seed is used.

Potato will grow in any soil, but farmyard manure, sulphate of ammonia, superphosphate and sulphate of potash and castor oil cake yield remarkable results. Acid vapour from acid factories in the neighbourhood

injures the crops. Lime is unsuited for the crops. Farmyard manure is helpful in developing a good root system. Very open and hollow soil is favourable for the growth. Big crops require good cultivation. If potatoes be sprouted before planting, risk from early frosts is reduced. From average soil 5 to 8 tons of potatoes may be had per acre, the record being 11 tons. This means an income of Rs. 330 per acre in normal times even from ordinary soil, and Rs. 3,000 per acre from a good field in abnormal times like 1942-45. Drying machinery is employed for making potato-flour. An acre of ground will produce a ton of maize giving not more than half ton of starch; eleven tons of potatoes over a ton of starch; $\frac{3}{8}\frac{1}{4}$ ton of wheat not less than half a ton of starch. The cultivation of potatoes, to be attended with excellent results, requires much care. Prolonged rain or damp air produces a kind of fungus in the shape of brown spots on the leaves. Discarded potatoes should invariably be burnt otherwise the infection is liable to spread.

As potatoes grow dear in summer, storage of potatoes at harvest time can turn out to be very remunerative. Sprinkle the floor with quicklime or unslaked lime; cover with a layer of 4 or 5 inches of potatoes; sprinkle with lime again, one-fortieth in weight of the potatoes to be preserved, the topmost layer being, of course, of lime. This method destroys any disease that may be present in the potatoes, and improves them if watery or waxy. The colder the room, the less liability of fungus.

Potatoes are best preserved by storing in an underground cell, previously fumigated with sulphur smoke, 3 lbs. of the mineral being used for every 1,000 cubic feet. When smoking all inlets of air should be closed. The floor should be plastered with cement so as to be damp proof. The temperature of air should be kept below 87° F. Seeds of different varieties should be stored separately and should be freed from dirt and well-dried. Soft and pulpy potatoes should be from time to time sorted and destroyed by burning.

The fungus in the fields is killed by spraying with copper sulphate solution.

For Potato Glue, see Chapter V (Mucilages).

Artificial Sago.— It is as nutritive as the genuine product. It is made by mixing damp potato starch with a little dextrine solution, rubbing the mass through sieve with 3 to 5 mm. mesh, rounding the particles in a rotating drum about 15 ft. long, dusting with fine powdered starch, sieving and drying at 100° C. in a chamber until a glaze is formed, when it is dried at a lower temperature.

STARCH

Starch has a variety of uses in cookery, confectionery and arts. Rice starch, whether easily obtained by grinding in a mill or with water in a mortar, makes very delicious dishes of *phirni* (pudding). Linen, collars and shirt cuffs are stiffened by the washermen by means of starch. When hot goose is passed over a thin shiny layer of dextrine, not unlike the one found in kettles in which rice has been boiled, is formed. Starch is made into Pastes (which see). The calico-printers use it as a thickening agent for colours and mordants, for finishing and weighing calicos, lace curtains and cloths. Thus it is that most of the rough cotton cloths contain so much starch, usually fine wheat flour called *maida*. It is used in the composition of face powder and for dusting moulds. In the manufacture of dextrine, in brewing, and preserving sugar, large quantities of starch are used.

There are many varieties of starch. In Europe they get it from potatoes, rice, wheat and maize. In India, we obtain it both from rice and wheat. It enters widely in the vegetable kingdom, being most plentiful in cereals, in roots and tubers (*Kanda mool* of the ancient Indians), in sago, and arrowroot (*ararot*) and in tapioca or cassava. Each variety has peculiar structure and can be detected by microscopic examination.

The cheapest starch is obtained from potatoes, fibres, etc., being fed to the cattle. In German villages there is a network of small potato starch factories. Now that the Indian exports in wheat and other cereals are running at a low ebb, it is time for us to turn to the manufacture of starch from the various sources enumerated above. The yield of starch from the various sources will be noted from the following table.

Source	Starch.	Cellulose Fibre etc.	Nitrogenous substance.	Fats.	Ashes.
Rice (husked) ..	76·80	0·6	7·80	0·5	1·4
Wheat	70·0	2·5	12·4	1·7	1·8
Maize	68·5	2·5	9·9	4·6	1·5
Potatoes	28·0	0·8	2·0	0·2	1·0

Potato Starch.—Potato contains about 20% starch, 1·5% of sugar and dextrine, and 75% of water. Young and diseased potatoes give a low yield of starch. Only grown up potatoes should be used for the manufacture of starch. The potatoes should be washed and peeled—this holds good in the case of other roots and tubers also—and rasped by a revolving grater. The pulp should be washed on hair sieves until freed from feculous matter. When successive washings of the pulp have filled the vessels over which the sieves have been placed, the starch held in suspension is allowed to settle, the supernatant liquid drawn off and the starch agitated with water until a sufficiently pure variety has been obtained. Then it is washed and dried either in the sun or with very gentle heat, never above 40° C. otherwise there may be gelatinisation. Centrifugal machines like those used in sugar refineries may be used for separating water when 30 to 35% will be left. For further drying special baskets or framework may be used. The water, fibre and washing water will serve as a good manure for cereals.

Careful manipulation can separate 80 to 90% of starch from potatoes. Potato flour sold in the market is a fine white powder, while artificial sago is granular potato starch. It is as nutritive as the sago. The process of manufacturing it has already been described in this chapter. For Potato Glue, see Chapter V (Mucilages).

Rice Starch.—On account of the albumens and gums present in the rice grains, rice starch in pure form is difficult to work out and is made only in large factories. The crushed rice unfit for culinary purposes

is soaked in a very dilute solution of caustic soda (3 to 6% solution will do or say 200 gr. of alkali to each gallon of water; stronger solution will gelatinise the starch) in large tanks plastered with cement. Caustic soda dissolves albumens and gums. The wet rice is ground between mill stones, keeping moist with caustic soda solution according to the above strength. The fine mass is put into the vats and stirred briskly. The cellulose matter sinks and a milky solution of starch is left. This milk is transferred to a centrifugal machine without any holes. The starch granules deposit themselves in a compact ring on the interior surface of the rotating drum, the outermost layers being to all intents and purposes pure starch. The inner surface of the starch ring is scraped and when in sufficient quantity from repeated processes it is worked again as before. To obtain pure white colour a trace of ultramarine is added. The starch is then cut into 7-in. cubes and pressed in iron moulds to squeeze out 55% of water. The cubes are then dried in drying chambers for about 3 weeks till the water content is reduced to 29%. The yellow surface layer of impurities is scraped off. The residue cakes are packed in glazed paper or cardboard boxes and dried until cracks appear, when only 12% water will have been left. While drying, guard against development of moulds. The rice-grain can be treated with a weak solution of ammonia or sesqui-carbonate of ammonia instead of with caustic soda. To whiten the starch, a little solution of chloride of lime is often added, neutralised later on by very dilute sulphuric acid, the salts so produced being removed by washing copiously with water.

Wheat Starch.—(a) *FERMENTATION METHOD.* Steep whole corn, well washed out, in soft water (See Industrial and Technical Directory) until it swells and softens and can be crushed within the fingers easily. During this time, change water frequently. Place the swollen corn in bags in vats of water and crush under the feet. Draw out the milky juice so produced by means of a tap. Replenish the vat with fresh water, and repeat the process until no more of starch can be obtained. The milk of starch is allowed to ferment in a cistern from 10 to 20 days

according to the temperature of the season. Fermentation produces weak acetic acid solution and helps to separate the gelatine and gluten. To speed up fermentation, liquor from a previous deal may be added. Good fermentation will produce pleasant vinous smell. Disagreeable fermentation should be avoided. During the fermentative period, agitate the liquor once or twice a day. When fermentation has advanced sufficiently, supernatant water is drawn off a tap, fresh water added and agitated with the mass and allowed to settle. The process is repeated till the starch has been well washed out. After the final washing is over the uppermost layer containing gluten and albumen is scraped off. The different layers are of varying degrees of purities and are best removed separately with wooden shovels, transferred to separate cisterns, stirred with water and passed through fine sieves. By washing and decantation, pure starch is obtained. The mass is then put into perforated wooden boxes lined throughout with canvas to drain out on the clean tables and cut into 4 or 5 inches squares and dried on half burned bricks. The pores of the bricks absorb moisture readily. When sufficiently dry, the blocks of starch are dried in an oven at a moderate heat, and the sides being scraped with knife packed up in paper, and subjected to gentle summer heat before placing on the market.

(b) *Martin's Process.*—For this purpose wheat flour is kneaded into a dough not unlike the one used for bread-making, kept for about an hour and placed in small balls in two rectangular vats adjacent to each other. The vats are provided with cranks working in opposite directions and connected with wooden frames, each of them carrying the bearings of four or other convenient number of grooved rollers. At the bottom of each vat, there are holes at intervals covered with wire gauze. Spring buffing apparatus are applied at the end of each trough. Under the holes there are placed sieves of fine wire gauze, and below these an inclined shoot which discharges the liquor into a suitable vessel. Above the vats, perforated pipe discharges numerous jets of water on the dough. When the cranks are worked with hand or engine power, the rollers separate the gluten, and the milky liquor runs out into

a separate vessel. After working sufficiently, only gluten is left. The starch can now be separated as in the fermentation process. Addition of caustic soda sp. gr. 1·013 in quantity just enough to turn red litmus paper blue after the mass has been roused up will hasten the process. For separation of gluten use No. 200 sieve. A sack of flour yields 110 lb. of moist gluten and 220 lb. of dry starch.

Maize Starch or Corn Flour.—It is a pity that for want of enterprise little effort has been made to obtain starch from this source in India, although in slack seasons, Indian corn goes so very cheap. In U.S.A. and America there is a number of factories which turn out 59 to 68% of starch from maize. Maize after clearing it thoroughly is macerated and steeped in water containing 0·3-0·4 per cent of sulphur dioxide at a temperature of 40° to 50° C. (104° to 122° F.). To separate the gluten, etc., 24 pairs of burr stones and 6 pairs of heavy iron rollers are used. The mills work day and night. The pulp is passed through a number of screens and drum sieves. With repeated washings impurities are removed, and then the precipitated mass is treated in centrifugal machines, description of which is given in Rice Starch above. From the separated shells maize oil is extracted by pressing.

Pearl Barley.—*Chapaties* made of barley meal *ghat* (parched barley), and *sattus* (flour of parched barley) possess very high nutritive value but are not so easy to digest. To obtain Pearl Barley which is now imported from England—this is carrying coal to New Castle in excelsis—pass the hard dried barley between horizontal mill stones, placed so far apart as to separate the shells without crushing the grain. According to Church, 200 lb. of barley produces 25 lb. of coarse dust or Block Barley.. Closer and longer grinding yields 29½ lb. of Fine Dust or Pot or Scotch Barley which on further grinding gives 30½ lb. of Pearl Barley. The dusts too are sufficiently nourishing.

Economics of Starch Manufacture.—Potatoes give 20% of starch; wheat 55%. All the same as the yield of potatoes weight for weight per acre is much higher, it is more profitable to get starch from potatoes than from wheat. An acre of soil on an average pro-

duces 12,994 lb. of potatoes and so 2598 lb. of starch against 1,860 lb. of wheat yielding 1,023 lb. of starch. Thus it will be seen that the yield of starch from potatoes is almost double. The Indian potatoes contain about 12 to 13 per cent of starch, but by careful selection and manuring the yield can be increased to 20% or even 24% as in Germany.

VERMICELLI

Vermicelli (*Sevian or Simians of the Indians*) and macaroni make delicious sweet dishes. Both vermicelli and macaroni were originally made in Italy. Vermicelli is drawn out in thin winding cylinders, while macaroni in pipes as big as of wheat straw. The Italians make their vermicelli by kneading together 21 parts by weight of best white flour, 14 parts of white potato flour and 12 parts of boiling water. The dough is pressed through Vermicelli Press and tubes drawn out, and dried in the sun.

The Indians make their vermicelli with coarse wheat flour, or with Suji or with fine white flour, mixed together. The first kind is easy to digest, the second one too is light but the next two kinds are not easy to digest. They make vermicelli without any machine even. Small bits of dough are rolled into small tubes, or rolled over an inverted pitcher and then allowed to dry over hedges.

The first two kinds of vermicelli as given above are very nourishing and are tonic to the brain. This is due to the fact that in boiling most of the vitamins present in wheat are retained while in baking they are killed.

To prepare vermicelli, boil one measure of the first two orders of vermicelli previously fried in ghee in two measures of water.

Let the mass simmer over slow fire till superfluous water has been absorbed. Then take off the fire and discharge into a colander, and mix sugar and milk to taste.

Profit can be made by pushing the sale of vermicelli in paper or cardboard packages. Addition of malt will make it a specialty. An excellent food for hawking in towns.

DIASTASE

Diastase or Amylase is a substance, contained in malt, in muscles, blood, liver, pancreas, and particularly in saliva. It is also found in leaves, twigs, in germinating seeds, in the bark, in the pollen grains, in yeast, in most of the mould fungi, the enzyme of Aspiergillus oryzae. Teka Diastase is highly prized. Diastase has the power of converting starch and glycogen into maltose. The starch is of course first converted into dextrine. Hence the importance of thorough mastication to mix saliva with food so that digestion should begin even with the mouth. It resembles the vegetable albumin. One part of diastase can convert 2,000 parts of starch into grape-sugar. It is said that malted barley contains 1,500th part of diastase. This small quantity is, however, capable of turning the starch of the malt into sugar in mashing while manufacturing beer.

Preparation.—(1) Digest green barley malt with dilute alcohol (20%) for 24 hours. Precipitate the extract with 2½ vols. of absolute alcohol. Wash the precipitate with alcohol and ether; purify by repeated solution in water and precipitation with alcohol, and also by dialysis.

Sulliven Method.—(2) Saturate finely ground pale barley malt with water for 3 to 5 hours, adding water just enough to cover the malt. Extract as much of the solution as possible with a filter press. Then add alcohol till a feathery precipitate is formed. Discontinue addition of alcohol as soon as the solution becomes milky. Collect the precipitate, wash with alcohol of increasing strength until water is removed. Press between cloth and dry in *vacuo* over sulphuric acid.

Malt.—Malt is made by moistening barley and stimulating it to germinate by heat at 50° to 55° F. spread in well-ventilated spaces, and stirred well. It is then dried at 100° to 170° F. The higher the temperature, the lower is the diastase activity. It is then thrown on to screens for the removal of the malt combs or culms. The latter are used for feeding cattle. During germination changes take place and a ferment *diastase* is formed. This under suitable conditions

can change the insoluble starch in the endospern into maltose and dextrine. The dried product contains sufficient diastase and is known as Malt. *For Malted Food for Infants, see Chapter XI.*

Malt Extract.—Macerate crushed barley in equal quantity of water for 3 hours. Add 4 parts of warm water; keep the temperature 15° F. for an hour. Boil up once, press, filter and quickly evaporate. Malt is known as *Jauash* in Persian (see Index). To make an emulsion with cod-liver oil, mix intimately, in a perfectly dry mortar or emulsifier, cod-liver oil with one half its weight of gum acacia; add at once one-half as much malt solution as the combined weight of gum and oil, and agitate briskly till the oil is turned into a cream which will produce a crackling sound as the pestle is moved rapidly round the sides of the mortar. This forms a very stable emulsion. To obtain good results, fine Norwegian oil should be selected.

Manufacture of Dextrine.—The term dextrine is applied somewhat loosely to the earlier products of the hydrolysis of starch. The sugar yielded by the action of diastase on starch is maltose, and at one time dextrine was supposed to be a single substance intermediate in composition and chemical composition between starch and maltose. It is now, however, generally conceded that dextrine and maltose are produced economically from hydrolysis of starch, and that at least two dextrines are to be distinguished; they are characterised by their behaviour with iodine, one giving no colouration, while the product of the other is red. Commercially dextrines are not classified in this manner, but differentiated by their respective methods of preparation. The first method of manufacture consists in roasting dry starch at a temperature of 220° deg. to 250° C. either over a direct fire or, better in an oil bath, or by superheated steam. Revolving roasters are often used. The process is continued until the starch has acquired a brownish colour and has become soluble in water. The second method is carried out by moistening the starch with about 1 per cent of hydrochloric acid or nitric acid and slowly heating it in open dishes until a temperature of about 100° deg. C. or 212° F. has been reached, and the acid has been evaporated. The sugar

accompanying dextrine made by the use of an acid is dextrose. Dextrine made in this manner is lighter in colour than that obtained by direct roasting, and is thus better fitted for certain uses. On the other hand, any residual trace of acid is an objection for many purposes. A special grade of dextrine of light colour, and having the translucent appearance of gum arabic, is also manufactured as a substitute for natural gums.

Purifying of Dextrine.—Dissolve $\frac{1}{2}$ dr. of alum in $\frac{3}{4}$ oz. of water. Add this solution to every pint of dextrine solution. Stir well. Then dissolving $\frac{1}{4}$ dr. of washing soda, add to the previous lot. Again stir well. Let stand just for a few days so that the ammonium hydrate may precipitate the suspended impurities and a lot of the colour.

DAIRY PRODUCTS

MILK

Milk like eggs is a perfect food, containing all the elements necessary for building and maintaining the functions of the body. Eggs, however, contain the constituents in a much concentrated form. Milk contains about 3·5 p.c. fat; 3 47 p.c. casein; 4·8 p.c. sugar; 72 p.c. minerals and 87·51 p.c. water. The buffalo milk is rich in casein and water; cow milk in sugar of milk. The milk of a cow giving the first calf is deficient in sugar of milk. In milking the cow, the first drawn milk is the poorest; the last drawn the richest, being almost cream. Ill health, fright, brutal treatment, furious driving, molestation by flies diminish the yield. Milk should not be kept in closed vessels for a long time. It should be cooled and aerated by refrigerators. The removal of cream increases the specific gravity of milk. At 60° F. one gallon of milk should weigh 10·27 to 10·34 lb.

Milk readily absorbs bad odours and is acted upon by disease-producing germs, which 'sleep' when milk is kept cool. It is, therefore, very essential to keep the baby's feeding-bottle immaculately clean. At a temperature of 160° F. to 170° F. the germs, but not their spores, are killed; at 212° there is complete destruction. Boiled milk, on account of the destruction of vitamins, is not so nourishing, but to be on the safe side in the towns it ought to be boiled just before taking

it. Persons suffering from infectious diseases ought not to be allowed to handle milk or to have anything to do with the dairies. In summer milk will turn sour unless it may be boiled and thereafter quickly cooled. Slow cooling again develops growth of germs.

Skimmed milk is very nourishing. It contains 3·5 p.c. casein; 4·1 p.c. minerals. It is an ideal food for fat children. They will get, if not fat, at least the body building salts. Butter milk left after the removal of butter from cold milk or from curd is most refreshing in summer, the sour type acting beneficially in liver complaints.

"Milk is produced directly by the breaking-down process of tissues in the glands, and is not dependent upon the composition of the food supplied, but is maintained in molecular equilibrium with the blood."—*Collins.*

Jersey, Guernsey and Kerney breeds give richer milk. In Brazil the breeding of cows has been carried to perfection, the famous Agassiz Cow yielding about a maund of milk daily. In India the rearing of cattle is limited to illiterate and unprogressive milkmen and cowherds.

Milkmen in big towns generally do not feed the cows on proper food and so their milk is poor. Underfeeding and overfeeding both are harmful. The cow should be looked upon as a machine for converting low-grade food, unfit for human consumption, into a high grade food, more efficient than fattening beast, and so killing milch cattle does not bring one-tenth as much profit as keeping them alive and milking them. As has already been said elsewhere, the urine and dung of cattle form rich manure. No wonder then that the Hindus would not tolerate even the slaughter of dry cows. As a rule milk-producing cows should be kept well within the reach of big towns. They do not, however, bear good calves. To breed good calves they require feeding on butter-milk or skimmed milk. This can be practicable only in villages away from the towns where milk is not sold but is used for manufacturing butter.

For cow-keeping and Dairying study, *Gokarnanidhi* by Swami Dayanand Saraswati. Employment for

Millions, and the big chapter on 'Co-operative Dairy Farming' in our *Industrial and other Openings for Young Men.*

MILK POWDERS

Milk Powder is made according to the Just Hatmaker process by the machine called "twin-cylinder" machine. Milk is exposed on the surface of rotating cylinders for ½ second to 3 seconds and by blowing in fresh clean air is evaporated to dryness, the liquid being constantly fed. The films produced are removed by the two scrapers, one on each side of the cylinder. The cylinders are heated internally by means of steam, a pressure of 40 lbs. (15 lbs. pressure on a sq. in. being equal to one atmosphere) being maintained. The pressure can be measured by a Manometer.—*Industry* for April 1918, pp. 20-21.

Another Account.

Fresh whole milk is drawn into a vacuum pan and a portion of its water removed. This condensation is halted while the milk is in a still fluid condition and before any of the milk albumin has been cooked on to the walls of the vacuum chamber. The milk is then drawn from the vacuum pan and sprayed into a current of hot air. Moisture of the milk is instantly absorbed by the air, and the particles of milk show. Upon examination, they are found to contain less than two per cent of moisture. The hotter the air, the more rapid the drying effect and the less danger there is of injuring the milk solids by heat.

"This method of desiccation does not destroy the globular condition of the butter fat, it does not burn the milk sugar, nor does it coagulate the albumen of the milk. It is not necessary to neutralise the acidity of the milk, for the moisture is removed so quickly that there is no chance for chemical action and neither the casein nor the albumen is affected in any way by the concentration of the acid. The difficult pasty condition of the milk solids is passed while the milk particles are suspended in the air and not in contact with heated metal. As nearly as I can estimate one pint of milk presents about two acres of surface when sprayed into the air. No bacterial action has been discovered in milk powder containing less than 3 per

cent. moisture and no chemical deterioration takes place."—*L. C. Menu.*

Humanised Milk for motherless children. New milk, 3 oz.; cream, $1\frac{3}{4}$ oz.; milk sugar, $1\frac{1}{8}$ oz.; water, 18 oz. Mix and sterilise. Offers great scope for sale.

Condensed Milk.—Quoted from the *Circular*—"The milk as it is received is run into square vats some four or five feet above the level of the bath and heating room. The bath tubs are circular, have the coil of steam pipe at the bottom and nearly filled with water. In this bath are set cans, each holding about forty quarts. The milk is run into these cans from the receiving tanks and is heated to from 150° to 175° F. It is then drawn thence into the heating wells, which have jacketed steam bottoms, and is then heated to boiling. It is next run into the vacuum pan, into which a stream of milk is kept flowing about as fast as the evaporation goes on. If the milk is to be preserved plain, without the addition of sugar, it is evaporated to about one-fourth its volume, and as soon as the vacuum is broken the temperature is raised to about 200° F. The vacuum pan is kept at about 140° F. If the sugar is to be added, the hot milk from the vacuum pan is run into pans containing the requisite quantity of sugar which is dissolved."

Sweet Milk Powder.—It can be made by adding a solution of 2 dr. of sodium bicarbonate in 2 oz. of water to which should be added 2 quarts of milk sweetened with 2 lb. of sugar. Spread this on a *tawi* (shallow flat iron dish) over slow fire. Milk willl be made so crisp as to be readily powdered. For carrying milk, milk as well as the cans should be thoroughly sterilised and on no account allowed to get too much sour. If bubbles arise, milk need not be used at all. 1 to $1\frac{1}{2}$ gallon of starter to 10 of the cream is the right proportion. If the cream is cooled much as we see in winter, more of the starter will be required. One inch top surface of starter should be thrown away so as to avoid dust and undesirable bacteria.

BUTTER MAKING

Churning.—This may be done in the usual Indian way but it requires a greater amount of time. The cream with the starter should be used. Barrel churn

gives speedier results and if the right temperature and proper agitation be employed, 30 to 35 minutes' churning is sufficient. For this purpose a round barrel, *e.g.*, one used for the carriage of wine, vinegar, etc., should be procured. At one end of the barrel, get a big hole made with a tight cover; and in the centre of top and bottom lids get two axles fixed, one with a handle to give it a rotary motion, when supported on two posts, just as the wheel and axle used in drawing water out of a well. Too rapid or too slow rotations delay the production of butter. Warm cream gives best results. In summer the temperature should be 50 to 55 degrees; in winter from 60 to 65 degrees. When the butter granules grow as big as the maize or Indian corn, the churning should be stopped, and the buttermilk allowed to drain in a vat. As soon as the whole of the buttermilk has been drained, water of the same temperature as the cream and thrice as much should be introduced in the barrel, and three to five revolutions given slowly so that the remaining buttermilk may also be washed away. On draining the wash water, add powdered salt according to the taste of the consumers, one oz. to one pound of butter is the usual proportion. The butter should be now worked on a table by means of a roller, taking care that its firmness is not destroyed. When the working has been only half done, it may be tasted to see if a greater quantity of salt has not been mixed which can be washed out by means of cold water. If on standing the butter for a few hours, it gives a mottled appearance, work it again. The best plan is always to wash the butter thoroughly before adding salt.

Packing.—Parchment paper with one's name printed on it may be used. For summer, light refrigerators should be employed for sending the butter to outstations.

Colouring.—Olive oil (*rogan zaitun*), 6 lb; annatto, 6 oz.; turmeric (*haldi*), 1 oz.; salt, 10 oz., nitre, 2·5 oz.; bromo chloroaum, 3⅓ oz.; water as much as required. Heat the oil in a pan on a water bath. Dilute to a thin paste the turmeric and annatto in water. Add this solution gradually to the oil in the sun. Keep the temperature at 110° F. Next add the solution

of nitre and salt, and let the resultant mixture be heated to boiling. Last of all add the alum, agitate until cold, and store in sealed cans.

Preservation.—If butter be handled with clean hands and the precautions noted above be observed butter may be kept from 6 to 8 months, in hermetically sealed boxes or canisters, *i.e.*, those from which all air has been excluded, in a dark and cool place. Packages as big as brick keep the flavour better than small ones. Again if it is to be kept in open cans place a layer of salt and nitre 1¼, one inch deep over 16 to 18 lb. of butter. An addition of honey or brown sugar, 2 oz. affords additional protection. These preservatives can be easily drained by means of washing with water.

Butter, Rancid, To Sweeten.—Dissolve 15 mm. of chloride of lime in half a seer of water. Wash butter with this solution. Let every part of the butter come in contact with this liquid. Then work with cold water.

Butter and Cheese, To Select.—In choosing butter, the best is straw coloured, firm, but not hard, and with a faint, pleasing sort of odour. To keep the proper flavour butter should be kept in a cool cellar, for all its best qualities are developed by cold. Cheeses such as Camenabest or Eoulommiers are the easiest to digest. They are commonly made with milk that has been partially skimmed, allowed to drain for a couple of days, and finally buried to ripen. Cooked cheeses, such as Gruyere, is made of hot rich milk, which is subjected by pressure from 45 to 50 minutes. The curdled mass is then cut with a wooden implement, kept about 10 minutes at a moderate heat, then moulded, and stored in a cellar to ripen. Cream cheeses should be eaten directly they are made, as they will not keep long and be fit to eat. It depends on what kind of cheese is required for selection, but adulteration (such as lard, etc.) is to be detected by several processes.

Milk-Increasing Powder.—Generally speaking when effort is made to increase the quantity of milk the quality of milk suffers. For increasing the flow of milk in cows or buffaloes the following mixture according to Hager should be tried.

Potassium nitrate or *shora*, 2 parts; alum (*phitkari*), 2 parts; flowers of sulphur, 2 parts; prepared or precipitated chalk, 2 parts; white bole, 4 parts; red clover, 10 parts; anise (*saunf*), 20 parts; fennel 20 parts; common salt, 20 parts. Reduce all to good fine powder and mix them thoroughly. *Dose:* One or two handfuls with the morning feed.

If difficulty be experienced in obtaining clover, substitute any other good grass or oats. In India the milkmen to get more milk feed their cattle on maize or oats. They thus fatten but at the same time weaken the cattle.

Milk, To Increase—Give 4 oz. of boiled French hemp. It will increase the quantity of milk as well as butter. In India, the milkmen are advised to make an experiment by using as much as possible *cannabis indica* which grows wild in the hills. The leaves should be chopped up and given with the fodder. If pans be turned over the milk so produced for 15 minutes, when first milked, it may yield double the quantity of butter. Stop churning cold milk as soon as granules the size of beans or maize are formed. After the whole butter has been skimmed off add as much water at the same temperature as the skim milk and revolve the churn four or five times. This will bring out the remaining quantity of butter. Wash the butter in the granules and work it with salt but not for too long, otherwise it will tend to appear like lard.

Milk-preservatives.—Milk when kept for long has a tendency to sour, more so in the hot weather. The following antiseptic powder much in vogue in England and elsewhere will be found of great use: Boracic acid, 18 parts; borax, 9 parts; glycerine, 6 parts. Baking soda alone often checks milk from getting sour.

N.B.—Soda kills the vitamins and must therefore be used only when absolutely necessary.

Morfit Process.—Dissolve 1 lb. gelatine in 1 gal. of milk at 130° to 140° F. (55° to 60° C). Let it cool to a jelly. Cut into slices and let dry. Gelatinize more milk with this compound. Repeat the process till the gelatine is in the proportion of 1 lb. to 10 gal. milk

ECONOMICAL WAYS OF MAKING GHEE

The Indian dairy industry may well add crores to its annual income if the wasteful methods now in use of manufacturing ghee are abandoned in favour of the cream separator method or the method of making ghee direct from cream, as certain investigations lately completed at the Imperial Dairy Research Institute, Bangalore, have shown.

The annual value of the ghee produced and sold in India is nearly Rs. 100,00,00,000. This is one-third of the total value of the milk and milk products and exceeds the total value of solid and liquid milk derivatives manufactured in India by about Rs. 15,00,00,000. Of the total annual production of about 700,000,000 maunds of liquid milk, nearly 360,000,000 maunds are used in ghee making, giving an annual output of 23,000,000 maunds of ghee.

CRUDE METHODS NOW IN USE

Crude, unhygienic and uneconomical, the present methods of making ghee in rural areas have remained unchanged for ages. The process consists in souring of boiled or unboiled milk in earthen or tinned brass pots by the addition of starter of uncertain quality, and separation of butter from the liquid portion known as butter milk, lassi, chhachh, matha or mohr, by churning the curd by hand with the help of a wooden churner, the butter being collected from day to day until a quantity sufficient for boiling has been obtained. The butter is then boiled or clarified over an open fire in an iron pan, and the resultant product is ghee.

The cream separator method which yields both cream and separated milk would add enormously to the income of the producers. The cream could be converted into ghee and the separated milk used either for liquid consumption or for conversion into suitable and profitable diverse liquid and solid derivatives which would be more remunerative to the manufacturer. Apart from facilitating profitable utilisation of separated milk, this new method helps controlled manufacture, yields a higher output of ghee of form and good quality and saves much time and labour.

The equipment required is small and simple, consisting of a hand cream separator and appliances

for collecting and heating cream and stirring and straining ghee. There is no souring of milk, and no churning of curd into butter.

If the cream separator is properly adjusted and handled, cream containing 50 to 60 per cent of butter fat is easily obtained. A small holder could separate his daily quantities of milk into cream for three or four days until the product obtained is sufficient for clarifying. A portion of the separated milk could be consumed or fermented to serve as lassi, and the remainder sold.

At the Imperial Dairy Institute, Bangalore, the cream was separated from fresh cow's milk by means of a hand cream separator. The milk was heated to 150° F. and then centrifuged. The hot cream was therefore diluted with the hot separated milk and re-centrifuged or reseparated for obtaining richer cream. In this manner cream containing 74 per cent butter fat was obtained and toned with the hot separated milk to different butter fat contents. Experiments have shown that butter fat and water contents do not much affect the quality of ghee obtained and that it is possible to obtain ghee of good quality from fresh cream. The new method has also been found to give 18 per cent more yield than the desi or indigenous method of making ghee from butter and also to enhance the keeping quality of the product.

MILK SUGAR

By the addition of milk sugar or lactose (C^{22} H^{22} O_{11} H_2O) cow milk is humanised and becomes fit for the fastidious babies. This accounts for the large sale of Albulactin sold in India during the first quarter of the current century. It is less than one-tenth as sweet as cane-sugar and keeps well for a long time. It is not subject to alcoholic fermentation. Lactic fermentation, however, does take place and, therefore, it is very essential to keep the powder dry in air-tight cans.

Besides humanising milk, lactose is much used by homœopaths for triturating medicines, for diluting strong drugs and in manufacturing penternitro-lactose, an ingredient of high explosive value.

Milk sugar is to be found in the milk of almost all mammals, but most so in human milk, cow milk

SUGAR OF MILK IS MADE IN A NUMBER OF WAYS

(1) The milk from which butter has been removed by means of a separator is heated with 10% of milk of lime to about 850°C. to precipitate the remaining casein and fat. The clear liquid is then saturated with carbon dioxide, and the purified liquid concentrated and crystallised. The purification is brought about by dissolving in water and precipitating it with alcohol. This is a preparation most suited for the druggists.

(2) Boil the skimmed milk. Add acetic acid to precipitate casein. Filter, evaporate in open steam heated evaporators or in vacuum pans. By boiling for several hours the whey becomes more cloudy, but then suddenly grows clear. The remaining casein is separated in large flakes, which can be removed by filtering the hot liquid. Boil to crystallisation. The raw milk sugar so obtained may be refined by the method suggested in (1) above and in the way cane-sugar is purified.

(3) Use hydrochloric acid or sulphuric acid instead of acetic acid in (2). Neutralise with lime water. Evaporate to the thickness of syrup in a vacuum pan Beaume (225°). Filter through a number of cloths in a high pressure filter press. On collecting sufficient filtered syrup, evaporate it to 110° F. in a vacuum pan again. When of thick consistency, cool it into shallow boxes, when in 24 to 48 hours, crystals having the appearance of yellow sand will separate out. Purify it as in (1). Animal charcoal may be used for decolourising.

Sugar of milk may be obtained in white, hard, crystalline mass or in white powder. When placed on the tongue it produces a gritty sensation. With dilute acids it is converted into dextrose and galactose.

If a solution of milk sugar in water be exposed to air, fermentation produces lactic acid.

See also Chapter XXVI.

POULTRY-KEEPING

To the majority of town-folk it would seem impossible to keep fowls profitably. But such an opinion would be mistaken.

The intensive system, which has been carried to such great lengths in Great Britain, the United States

and the Continent has proved beyond doubt that poultry well-housed gives far better results than can be obtained by semi-intensive methods.

Major P. H. Falkner, R.A.M.C., of Loughton, Essex, and Mrs. Baynes of Bonham Woods, Herts, are England's greatest authorities on the intensive system and have proved that it yields excellent results.

In India, where labour is cheap and grain less expensive, the cost of feeding a pen of six hens for a year works out at about Rs. 36, plus Rs. 24 for the sweeper.

If the crowing of a cock bird be unwelcome to oneself and the neighbours, the owner need only keep hens, under these circumstances, the eggs are not liable to go bad, being unfertile.

The strain is the main point, but birds bred from a 200 egg strain (*i.e.*, birds whose parents laid 200 eggs in the first year), are procurable in India and cost from Rs. 15 to Rs. 20 each.

Six hens would then give the owner somewhere about 1,000 to 1,200 eggs per annum the first year, and about two-thirds of this amount in their second year.

Most of the English stock or breeds lay the full 2-ounce egg. The common country hen's eggs seldom weigh 1½ ounce each.

The normal rate for bazaar eggs was from 12 as. to Re. 1 per score, and working out at an average daily consumption of eight eggs, the cost per annum, to say a man and wife only, will be Rs. 146. The weight will be about 182 lb. of eggs.

On the other hand by keeping one's own fowls, the returns are 1,000 by 2/16 or 125 pounds of eggmeat for Rs. 60 per annum. All eggs, being unfertile, are storable, and the owner is sure of freshness.—*Statesman.*

N.B.—The calculations given above are based on pre-war conditions.

PRESERVATION OF EGGS

Eggs are perfect food. They contain all the elements for building up the body; protein, carbohydrate and fat, all in proper proportions. Even those who cannot keep a poultry farm can collect eggs in August and September or as early as July and try according to anyone of the methods given below to preserve them

in big lots to command a big sale in winter.

Selection of Eggs.—(1) In buying eggs be sure they are fresh. The density of eggs decreases as the eggs grow old. In half a seer of water dissolve one chhatank of common salt. Fresh eggs will sink to the bottom in such solution, old eggs will almost swim on the liquid ; while more than 3 days old will float.

(2) If a fresh egg be held in the fist and seen through, it will be opaque to light, while an addled one will be transparent.

To Preserve Eggs.—(1) **Sealing Method.** To preserve the interior of the egg in its natural state, it is necessary to seal up the pores of the shell air-tight. This may be done by dipping them in melted suet, olive oil, milk of lime, solution of gum arabic, or covering them with any air-proof varnish. They are then packed in bran, oats, meal, salt, ashes, or charcoal powder.

(2) **Jayen's Liquid** (expired patent) is thus made.—Take a bushel of lime, 2 lb., of salt, ½ lb., of cream of tartar and water sufficient to form a solution of sufficient strength to float on eggs. It is said that eggs preserved in this liquid may be kept for several months if rubbed over with linseed oil or poppy oil.

(3) **The French Way of Preserving Eggs** is to dissolve 4 oz. of beeswax in 8 ozs. of warm olive oil ; in this put the tip of the finger, and annoint the egg all round. The oil will immediately be absorbed by the shell and the pores filled up in this way. If kept in a cool place the eggs will keep for a long time. Cheap beeswax which is made with an admixture of paraffin will equally do.

(4) Take the eggs fresh from the rest, and wrap each one separately in paper. Then place in a pot layer upon layer until your box is full. Then fasten down the lid so that your eggs are firm, and turn the box completely over two or three times a week. This is said to keep them fresh for twelve months.

(5) Six quarts of boiling water should be poured over 3 lb. of quick lime, 1 oz. of cream of tartar, ½ lb. of salt, and placed in a large stone jar. Let stand until quite cold ; then put in the eggs. Keep air-tight in a cool place. Eggs packed in this way are said to keep fresh for more than a year.

(6) **Lime Method.** Take a water-tight vessel on the bottom of which place a layer of eggs, small, and downwards. Get some fresh unslaked lime, and dissolve in water to the consistency of cream, and pour this over the eggs until covered. A second and additional layer may be added any time. Be sure that each layer is covered entirely with the water. By this method, eggs can be kept for months. When cooked by boiling add a pinch of salt to the water, as the shells are apt to crack.

(7) **For Sending the Eggs to Foreign Places.** 8 measures of bran mixed with 1 measure of quicklime will serve as an excellent packing material. At least 70 % of the eggs will keep fresh for four months.

(8) **Water Glass Method.** Smear a small quantity of the clear syrupy solution of silicate of soda over the shells. In normal times water glass sells at about 8 annas a pound. While dry, a thin hard glassy layer is deposited which seals up the pores. Eggs thus coated and stored in charcoal powder (which can be had in plenty from charcoal merchants) or in a mixture of charcoal and bran will keep for a very long time. Eggs preserved in this way are as good in taste as the new laid ones. Hundred per cent success may be expected.

BONE ASH

Bone Ash is also known as Bone Earth. It is the residue after heating bones in presence of air till they are white. It consists chiefly of phosphate and carbonate of lime. From the bone ash phosphorus and phosphoric acid are obtained. The manure is prepared by taking out the oil by steaming. Bones thus treated are richer in phosphoric acid (about 30 per cent).

It is a pity that in the past owing to the ignorance and want of enterprise on the part of the Indians such large quantities of bones should have been exported and the country deprived of a rich phosphatic manure.

Bones crushed form a fine powder. The grinding mills produce bone ash. The finer the bone ash, the more readily is it assimilated by the plant. If dissolved in weak citric acid, the bone ash is totally dissolved and in this form it is recommended as a quick manure.

In sugar-refineries considerable quantities of bone-black are used for filtering. Bone-black is formed by heating cleaned bones in closed ovens. After a time the bone-black is rendered unfit for sugar-refining. This is sold as a fertiliser, and by burning it bone ash is obtained. When bones are kept immersed for a day in cold dilute hydrochloric acid (1 : 6 or 1 : 8) the fleshy portion called gelatine is left and the calcium phosphate is dissolved by the acid. The acid liquids together with gelatine pieces are precipitated with lime just enough to recover all the phosphoric acid, giving a precipitate about half dicalcium phosphate and half tricalcium phosphates. Both of these are very useful fertilisers for growing turnips.

Bone dust is sown along with the seed in a drill. It is claimed that this treatment gives 30 % to 50 %, more weight in grain and straw than by common methods followed in India. In these days when Indian wheat has to compete so unfavourably with Russian and Canadian wheat, bone ash should be increasingly used as a fertiliser. Used alone 70 bushels per acre will do ; but when mixed with ashes or other common manures, 30 bushels will be quite enough. When coarse bone ash is used, it acts slowly, and though it may not give so high a yield, its action continues for seven years.

The superphosphate of calcium acts more readily. It is made by treating bone ash with sulphuric acid. Treatment with citric acid is, however, most recommended by Collins.

TOBACCO

Tobacco contains starch, sugar, albuminoids, tannin, and two alkaloids, nicotine and *nicotianin*. It is due to these two alkaloids that the narcotic effect is produced.

The original home of tobacco is America from where Sir Walter Raleigh introduced it in England from where it in turn was carried into different other countries. The Newzealanders say that the English brought to them three good things, *viz.*: gunpowder, tobacco and wine. Tobacco belongs to the same family as potato, tomato, and nightshade. It branches towards the top of the stem. Some big leaves are 20 ft. long

flowers being large, tubular, and pink in colour. A glandular secretion makes the whole plant sticky. The finer qualities of tobacco are producd in a warm and moderately moist climate, and a very rich, sandy loam well-drained, containing big amount of potash and lime. Phosphates are not directly applied, the soil having received them in some other previous crop. Chlorides have a harmful effect on the crop. Most suitable manures even should contain nitrogen, 5 p.c.; soluble phosphate, 17 p.c.; and potash, 7 p.c. or in other words about 1 part of potash, 2 parts of sulphate of ammonia, and 4 parts of super-phosphate. Lime has great effect on the cultivation of plant; it should not be less than $\frac{1}{2}$ per cent and more than 2 per cent in the soil. Other manures for a rich harvest are potassium carbonate, potassium sulphate, saltpetre, and calcium sulphate (gypsum). All of them impart to the leaves a rich flavour and burning quality. Gypsum is best for top dressing. Well-water containing nitrates is favourable for the growth of tobacco.

A few days prior to flowering, the buds and lower leaves should be clipped off, leaving behind only eight to ten leaves in each plant from the top. When the leaves feel thick, gummy and begin to turn pale, they may be plucked leaf by leaf. This is especially applicable to better qualities. They are then dried—in India even in the open fields; in England in the curing barns, in both cases good ventilation being of the utmost importance. They should not be allowed to dry too quickly or turn yellow, otherwise flavour will not be properly developed. Some growers dry the leaves by tying the leaves with a line just like washermen. Good tobacco must have a brownish colour. The production of mould must be guarded against. All these processes destroy the undesirable elements and increase the quantity of amids.

The tobacco seeds are drilled in the middle of March or April in hot beds, the ground having been well levelled, the clods being well-broken. After sowing the seeds they are lightly covered up with earth. As frost and blight have injurious effect, the seed beds should be covered with mulch, mulch paper, or matting, till the germination takes place. The seedlings should

be protected from rain and too much of sun. When three inches high, the seedlings should be transplanted from the nursery into furrows, where they may possibly be irrigated, later on the position of riggs and furrows being changed. Tobacco plant is ready for harvest in about 3½ months. U. K. realised £54,000,000 as duty on tobacco in 1926-27. The consumption in India is also fairly heavy; one pice per head daily may be taken as an approximate average.

TOBACCO-PRODUCTS

Nicotine is a poisonous principle of tobacco. Its formula is $C_{10}H_{14}N_2$. The American Indians dipped the tips of their arrows in a juice of tobacco and shot tigers fatally. Two grains of nicotine is sufficient to kill a big dog. Smoking with the hubble-bubble or with the nargulli in the Indian fashion rids the smoke of a good amount of nicotine, the water in the hubble-bubble acquiring a very unpleasant smell. This water is good for killing the vermin. The boiling point of nicotine is 241° C. It is soluble in water and alcohol.

Nicotine may be extracted directly from the pungent water of the hubble-bubble or from a concentrated solution made by steeping leaf, mid-ribs and waste-tobacco. By distilling this liquor, the distillate obtained contains a crude form of nicotine. By acidifying this with oxalic acid, evaporating to a small bulk, and then decomposing by potash, nicotine floats on water and may be skimmed off. Nicotine is good insecticide in horticulture. *See Chapter XIII.*

Snuff.—The Northern Punjab is the home of the manufacture of fine snuff, the chief centres being Nowshehra, Haripur Hazara, and Peshawar. The snuff produced is of reddish brown colour and is exported to different parts of the country. Cheap varieties of snuff are made elsewhere, also by powdering finely special varieties of tobacco and sifting the flour through fine muslin cloth. Those engaged in these factories suffer from constant flow from the nose.

Snuff taken occasionally, especially in winter, is helpful to the brain. It encourages the flow of mucus and clears the head of phlegmatic matter and all that clogs the brain. It strengthens eyesight and is an

effective remedy against over-much dry nose. Besides the ordinary snuff, medicated and perfumed snuffs are also made thus :—

(1.) Take select tobacco, *e.g.*, *moto*. Steep the leaves in rose water overnight. Dry in shade or under a winter sun. When crisp, reduce to a superfine powder. Sift through muslin cloth over a canister the top of which has been knocked out. Triturate with a few drops of otto of *henna*. Bottle.

(2.) Bake clean tobacco leaves on an iron plate over slow fire. Dry and reduce to powder and sift as in (1) above. Triturate with a few drops of otto of rose and of *khushkhus* (vitivert).

Zardah.—Best *zardah* for chewing with or without betel-leaves may be made with the following prescription :—

Take good tobacco leaves and wash them in water to free them from dirt and some of the nicotine. Dry them in shade, but beware lest they should become too crisp. Pound them in mortar to reduce to fine shreds or small pieces. Then to each seer of the leaves add oil of cinnamon, 40 drops ; oil of cloves, 20 drops ; otto rose, 20 drops ; oil of neroli, 4 drops ; mix well with the powdered mass. Bottle in air-tight phials.

To produce better quality *zardah* five pieces of gold or silver leaves, or musk (genuine or artificial or synthetic), and tincture or seeds of cardamom may be added.

BIRI MAKING

Biri making.—The art of Biri making is so simple that it can be learnt by observing the manufacture for a couple of hours. The implements required are a pair of scissors, some thread, preferably dyed, a wooden box with a bottom of wire gauze ; furnace: a stove burning charcoal or coke, bamboo trays.

The tobacco mixture is generally made from the *Nepani, Hindustani or Gujrati* varieties of tobacco. The leaves used for wrapping are of *Tendoo* or *Tamru* trees. As the leaves of *plash, dhak* or *chhichhra* trees are very useful for allaying even hacking cough, experiments must be made to use these leaves for enveloping the tobacco. The leaves are sold in bundles just as in the Punjab the *dhak* leaves can be had. The leaves

should be steeped in water for some time so as to make them pliable, strained to get rid of superfluous water, and then cut to size for wrapping. The tobacco should be cut into shreds, put into the wrapper and rolled into conical shape. The tips can be tied with thread and the ends slightly singed. The *biris* are then packed in bundles containing 25 each, and labelled tastefully to command bigger sales.

For packing the *biris*, make a wooden box 2 cubits high, 2 cubits broad, and 3 cubits long, without having any top or bottom. Fix in it another box with the above length and breadth, but with only half the height and having wire gauze at the bottom and a lid. Place *biris* with broad side downward into the wire gauze box, cover it with the lid, and slide it inside the other box. Place a charcoal oven underneath the wire gauze. As soon as the ends of the *biris* become brownish, the *biris* are ready for packing.

Common *biris* may be made from *Nipani* tobacco, No. 1, 2, 3 or 4 ; or from *Gujrati* tobacco, No. 1, 2, or 3; or *Hindustani* tobacco No. 1 or 2. Scented *biris* can be made from the dust of *Nepani* tobacco No. 1 perfuming with otto musk or artificial musk *i.e.* synthetic musk, or with otto *henna*, or with otto geranium rose. *Gujrati* tobacco No. 1 may be scented with otto *henna* ; and No. 2 with otto *keora* ; *Hindustani* tobacco No. 2 with otto *chameli*.

HAVANA FLAVOUR FOR TOBACCO

Havana Flavour for Tobacco.—For giving Havana Flavour to tobacco, it is first soaked from 6 to 12 hours according to its rankness, in tepid or hot water. This is to dissolve out and remove a gummy substance that gives the tobacco its offensiveness. While macerating, the leaves are frequently stirred, or gently squeezed by suitable machinery, and the water is changed as often as may be necessary to facilitate the process. After soaking it is gently pressed out, rinsed and dried. After drying, it is treated with an infusion of the stems and ribs of genuine Havana tobacco, either by sprinkling or by immersion and maceration according to the uses to which the finished product is to be put.

When the tobacco is intended for use in cigars,

it may be treated with any of the following formulæ.

(*a*) Fluid extract of valerian, 1 ; tincture of tonka bean, 8 ; 94 per cent alcohol, 23. Mix them.

(*b*) Tincture of valerian, 3 ; butyric aldehyde, 4 ; tincture of vanilla, 2 ; ethyl nitrite, 1 ; 94 per cent alcohol, 40 ; water q.s. 128 parts. Mix them.

CASTOR OIL

The castor plant (*Ricinus Communie*) will grow in any soil. It does not require much water and care. In the Punjab and U. P.* castor plant hedges are found around sugarcane farms or in between farms of pulses. The oil is viscid, colourless and much used in medicine as a purgative. In 1917 United Kingdom consumed six million gallons of the oil for lubrication of aircraft engines. Mixed with other oils or alone it is extensively employed in lubricating the cylinders of engines and in axle-boxes of railway waggons. With its help artificial leather for upholstery is manufactured. Some artificial rubbers and various kinds of celluloids require this oil in their composition. Colouring may be imparted to butter. Turkey-red oil, so largely used in dyeing of cotton fabrics, can be made with the help of castor oil. The oil is used for making transparent soaps. In this respect it resembles glycerine. Castor oil produces two acids : sebacic acid for manufacturing candles, and caprylic acid for making varnishes for high class furniture and bodies of carriages. For instantaneous action, it is used in making some kinds of fly-papers. In the last place certain water-proof articles require its help.

Extraction.—Castor oil is extracted by (*a*) expression ; (*b*) boiling with water ; (*c*) agency of alcohol. The third method is very expensive and is used only in some parts of Europe. To use the first method outer skin is removed by rollers. Then the kernels are crushed and heated when a clear and fine oil is given off. The outer skin is used for manufacturing purposes. This saves from the loss of thicker portion or stearine and the thin portion of the oil from being discoloured. The oil so produced is then purified by jets of gas, acids, and heat at about 150° to 160° C.

* In the Punjab castor oil plant is cultivated on a very small scale, in U P, it forms a commercial crop mixed with the crop of

The Americans generally employ the second method. After clearing the seeds thoroughly, they heat them as hot as can be borne by hand, and so render the oil more fluid, and, therefore, much more readily expressible. The seeds are then quickly pressed. The oil so obtained is boiled with considerable quantity of water, the impurities being taken off as they rise to the surface. By this process the albumen coagulated by heat and the mucilage, acids and starch are dissolved by water, and float in a layer between the water and oil. The supernatant clear oil is drawn off and boiled with a very small quantity of water until the water vaporises no more. This can be tested by taking a sample in a small phial which on cooling should present a perfectly transparent appearance. Care should be exercised not to heat over much otherwise the oil will become brownish and acquire acid taste.

Deodorising Castor Oil.—Deodorising of castor oil may be effected by subjecting it to the simultaneous action of steam at 108 deg. to 110 deg. C., and of a saturated solution of alum or aluminium sulphate. The oil is kept at a temperature of about 80 deg. C. until the sediment deposits, after which the clear upper layer, which is now odourless, is withdrawn. Oil thus treated is said not to resume its odour on warming, even as is the case with fish oils.

MOWHA SEED OIL

Mohwa (Mowha) or Bassia seed is extensively cultivated in the Central Provinces, in Madras Presidency and in Ceylon. The oil is soft and yellow and of the consistency of thin butter. It is used as a salad oil. The soap made with this oil saponifies and dries quickly and serves best for the laundry. The cake after expressing the oil contains much saponin, a poisonous glucoside. It does not kill the cattle but its nutritive value is very doubtful. As it contains $2\frac{1}{2}$ per cent of potash it can serve as an excellent fertiliser where harmful insect life is also to be destroyed.

SESAME OIL.

Sesame is the same as Gingelly or *till* seeds which are grown all over sub-tropical and tropical India, most as hedges for cotton or other leguminous crops.

The variety produced in Central Provinces is the best, the quality of oil given out being very pure and transparent. In the Punjab owing to lack of knowledge the farmers grow black *tils* which are freed from the black husks by soaking with water and then rubbing with feet in a big cloth over which water is constantly sprayed. *Tils* are largely used in making dainties like *reories*, *gajak*, and *bhugga*. The seeds are very rich in oil, yielding 45 to 57 per cent of oil. The oil drawn by cold process is very fine and palatable and used both for making hair oils and as salad oil. By raising the temperature, another 10% of oil may be extracted, but this gives an inferior quality for soap-making and for the manufacture of low-grade margarine and lubricants. There is 30 to 40% of albuminoids and only 6% of fibre in the cake.

Refining.—Let the oil stand still in a tank when dirt and impurities will settle down. Filteration is a much quicker process. The filter press "consists of a series of grooved iron plates, hollow on the inside. These are clamped together and contain pieces of cloth separating them. The oil is thus forced through a succession of cloth filters and the solid matters are caught and deposited in the spaces between the cloths." This gives bright and pure oil. The oil should never be allowed to come into contact with water otherwise it is liable to grow rancid and ropy. This precaution should be specially observed in handling hair oils.

HEMP SEED OIL

Hemp grows wild as a thick undergrowth in some of the Indian forests. The leaves of best quality are used as an intoxicant. When rubbed over a stone-slate, they yield *sulpha*. The seeds can yield an oil of pale colour for illuminating purposes, for soap and for making varnishes. The oil on keeping becomes darker. Edestin, the chief protein of hemp seed, is readily precipitated by sodium chloride, much more readily by iodides and bromides; also by acetates of lead, copper and silver.

RAPE SEED OIL

Rape seed (*Colza* or *Sarson*) is largely grown in the Punjab, especially in the Cis-Sutlej territory. It contains about 33 to 43% of oil, 22 to 27% of

albuminoids, 4% of fibre, the French variety being the richest in oil. The cold-drawn oil is much used for frying and as salad oil. It is the best oily substance for keeping the hair black. The oil is also used for lubricating purposes and for making cheap soap. The cake left after pressing out oil by the cold method is relished by the cattle, though doubt is expressed if the cake left by the hot process has at all any food value. By expressing oil from rapeseed mustard, the enzyme present in the former converts the whole into mustard oil. This, however, leaves a cake, pungent and irritating to the cattle and even poisonous.

LINSEED OIL

Linseed grown in cold, damp climates tends to produce over-much fibre; that in drier and warmer localities, an abundance of seed. The seed contains about 35% of oil. It is first cleaned from its various impurities and crushed within rollers. It is then passed through as "kettle" where it is subjected either to direct steam heat, or to the heat from steam passing through a coil or both. The Indian linseed being rather dry requires moistening by blowing steam into it before extraction of oil. The linseed is then placed between felts, which in turn, are placed between corrugated iron sheets, which are built up into a pile of twenty or thirty in a hydraulic press, without using any water. Pressure being applied the oil begins to run out. The crude oil so obtained contains many impurities, *e.g.*, water, mucilaginous material, glycerides of organic acids, and organic colouring matter.

Refining and Bleaching.—In former times the oil was bleached by exposing it in flat bottles to sunlight for some months. This, however, thickened the oil and made it rancid. Commercially it is heated to 70° to 80° C. and allowed to stand. This coagulates and precipitates any albumen left out in pressing. Then 2 to 3% of strong sulphuric acid is agitated strongly with the oil. It is left to work for 24 hours. The acid warms the mucilage, absorbs the moisture, and precipitates all other impurities, leaving pure oil on the surface.

The application of peroxide of sodium and hydrogen, potassium permanganate and bicarbonate,

ordinary bleaching powder and chlorine, sulphurous acid and sodium hyposulphite, ozone, etc., is also attended with satisfactory results.

Dark linseed oil refined by means of petroleum spirit leaves a cake unfit for cattle food. Being rich in iodine* linseed gives a drying oil of the first rank. Heated with driers like manganese and lead to a temperature of about 150° C., the boiled oil is obtained. To form a rubber substitute sulphur chloride vulcanizes linseed oil.

The hot cake from the press should be dipped in water to give it a bloom. The kind containing some oil is the safest cattle food, and most popular for rearing calves. The enzyme present in the finely ground cake is capable of producing acetone, prussic acid and glucose under certain conditions. The enzyme begins to act between temperatures of 20° C. and 60° C. The dry linseed tends to evolve prussic acid, but the steam used in pressing the cake counteracts the poison. There is little risk to the adult animals. In making the cattle meal, warm water should on no account be used, nor again big balls allowed to be swallowed. No starch is present in linseed as in other oil seeds.

Refining.—(Another method.) To every 118 gallons of linseed oil, pour in 3 pounds of sulphuric acid. Stir briskly for 3 hours. Then add 3 pounds fuller's earth, and 7 pounds of fresh hot lime and agitate the mass for another 3 hours. "The oil must be put in a copper vessel with an equal quantity of water." Boil for another 3 hours. Take off the fire. When cold draw off water. Let stand for a few weeks.

Linseed Oil, To Prepare Boiled.—Linseed oil is boiled either in open pans according to the old method but in this the risk of fire is great. Now-a-days the risk is avoided by heating the oil with steam coils.

In the open pan system, cylindrical boilers or cauldrons are used. The plates of the boilers are rivetted. The bottom of the boiler is made round, and round it brick-work is piled up. The capacity of the

* This fact indicates that linseed oil is excellent for all preparations made for healing the wounds It should not, however be used for the ear, as it is a drying oil, except in case there is flow of pus etc

boiler is from half a ton to five tons. The boilers are filled up to two-thirds of their capacity with the oil. At the top of the boiler is provided a hood for the escape of the fumes. A wooden stirrer is worked from outside the shed.

The crude oil is first allowed to settle for several days, when most of the impurities are precipitated. Then the desired quantity is pumped into the boiler. As the crude oil contains watery elements, it froths up. This froth is broken up by means of the wooden stirrer alluded to above, or a part of the oil is taken out by a scoop (*dohri*) of a considerable size and as it cools, it is again poured in. Should there be sensed any risk of boiling over, the fire should be at once quenched by means of wet sand or wet earth kept ready for the purpose. A little carelessness on the part of the operator may set the whole factory ablaze. After a time, when all the moisture has been driven out, the oil begins to boil quietly. At this stage a Fahrenheit thermometer dipped in the oil will register 500 degrees. Agitate with a paddle to prevent oil from burning at the bottom. Half an hour later begin to add the driers, 4 to 5 tons per ton of the oil taken. Continue boiling for an hour more. Extinguish fire, cover the oil, and let cool till next morning. Take off the scum. Transfer to the storage tanks.

COTTON SEED OIL

In India cotton seed is largely grazed to the cattle, especially to the milch-cows and buffaloes to increase the fat-contents of the milk they yield. Purified cotton seed is widely used in U. S. A. and Egypt as salad oil, and as there is scarcity of pure and fresh clarified butter in big and populous towns, industrialists will do well to put on sale in place of the so-called vegetable ghee purified cotton seed oil. The vegetable ghee it must be understood contains traces of caustic soda with which the oil is purified and so is an irritant to the throat. At any rate this oil is infinitely better than the so-called vegetable ghee which is nothing but a form of mineral paraffin or purified and granulated groundnut oil and fit for only those people in whose case the medical authorities would reduce the fat constituents in diet. Cotton seed oil is also used as a substitute for lard,

and is much employed in making artificial butter as oleo-margarine.

Cotton seed is rich in oil, yielding as much as 30 per cent, the Indian varieties yielding lesss. It is, therefore, of great importance that to obtain the maximum quantity of oil, the best variety *e.g., narma* or long staple variety should be chosen. Crush the seed under your teeth and choose the kind that contains most kernel. The ordinary Indian varieties yield about 5 maunds of crude oil for every 40 maunds of seeds taken. The oil obtained from fresh seed is paler in colour than that from old seeds. The latter can, however, be clarified by washing with caustic soda and cooling till steam separates out. Unlike linseed oil, cotton seed oil is not a drying oil, and is used for lubricating purposes also.

To extract oil, the seeds are first ginned with a special machine to free them from the fibre not removed by the ordinary ginning machine. The teeth of the machine grip closer. The cleaned seeds are passed into a rotary cylinder, containing 24 fixed circular knives, and an equal number of cutters. These mince the seeds very small. The husks are now separated from the kernels and form a valuable food for the cattle. The kernels are then pressed through rollers like those of sugarcane mill when some of the oil runs out. "The mass is then put into woollen press bags, laid between horse-hair cloths, covered with rifled or perforated leather to enable the oil to flow more freely, and submitted to hydraulic pressure." On warming the bags under pressure for 17 minutes, the balance of the oil is forced out. For clarifying the oil, 7 to 15% of caustic soda should be added to the crude oil, the whole mass being agitated for some time. Force a current of air into the mixture by means of an air-pump. This will neutralise the acidity and precipitate the impurities of the oil. Let alone when it will be clarified. (*See also Ghee Substitutes.*)

GROUNDNUT OIL

Groundnut is otherwise called peanut and earthnut. Another name given to this oil is Arachis oil. The groundnut is so called because the fruits bury themselves into the soil. It is a leguminous plant and so

very valuable as a course in tropical climate. It grows best in sandy soil in conjunction with cotton on irrigated light soil. The yield of oil from the beans is 40 to 44%, 28% being albuminoids. The cold drawn oil is the best, other fractions being obtained by hot pressing. The cold drawn oil is used as salad oil, the second quality for the preservation of sardines and the manufacture of margarine; the lowest quality, obtained by highest temperature, being used for soap-making. The Modi Banaspati Manufacturing Co. of Beghamabad has made a beginning in utilizing this by-product for soap-manufacturing. The oil contains arachidic acid, due to which over much use of raw peanuts produce irritation in some throats. It is a mistake to suppose that arachis oil is drying. In this respect it is on a par with cotton-seed oil and as such can replace olive oil. It is a pity that so large quantities should be supplied from Pondicherry to France and India should lag behind in expressing and making use of this oil. The Province of Kamantung in China has a thriving industry in the extraction of this oil. The peanut cake being very palatable is greatly relished by the cattle.

For Oil Refining see Chapter XXIV.

PEANUT DAINTIES

Peanut or groundnuts are relished in a variety of ways both in India and America. They are taken straight, or scorched. The latter variety yields a better taste and is crisp. Scorched and shelled peanuts are salted and taken with fried pulses of gram or *moong*. In Bengal, peanuts are known as China almonds The acid present in peanuts is irritating to sensitive throats, but not so the candied dainties which are made in the following ways :—

1. Chinese Peanut Candy.—Remove the red skin of one pound of shelled peanuts by placing them in a hot pan for 13 minutes. Make a thick syrup with one pound of sugar and add the peanuts. Mix well. Pour the mass into a shallow iron plate (*tawi*) and roll into half inch thick cake. Cut in squares or diamonds as *barphi*.

2. Peanut Barphi.—With the thick syrup of sugar in Process No. 1 above incorporate ½ to one pound

Khowa. Take off the fire and add a few drops of otto rose or *Keora* water. Roll as in the foregoing process and cut up in pieces.

3. Peanut Crisp Candy.—Moisten two cups of *desi* sugar with ½ cup of water. Bring to the boil in a saucepan. As the sugar is thoroughly incorporated, increase heat till a syrup of the *patasha* type is made. Add 1 teaspoon of vinegar and pour off on 1 cup of peanuts spread on an iron plate which has previously been greased with ghee. Mark creases with the edge of a knife and when firm enough, split up into squares.

Peanut-butter Candy.—Roll like coarse crumbs one pound of freely roasted and shelled peanuts. Then take 2 pounds of sugar and boil together for 8 minutes syrup of *patasha type* with a level tablespoonful of butter and ½ lb. of *khowa.* Incorporate the nuts and roll as in the foregoing processes.

Peanut and Sweet Potatoes.—Select medium sized sweet potatoes (*Shaqar-qandi*) and steam them. Remove the skins, cut lengthwise in one-third inch slices. Spread with peanut-butter. Dust over with a very small quantity of nutmeg powder. Bake in an oven till the mass becomes crisp.

CATECHU OR KATHA

Katha is obtained from the extract of the plant Acacia catechu (*khair*) which grows wild in forests of Rangoon, Janakpur and the hilly parts of Jamuna. The inner brown-coloured wood is cut into chips, packed in three or four gallons of water in earthen pots, boiled to one half, when the chips are removed, and the decoction from 20 to 25 pots transfered to a big cauldron. It is again boiled and stirred with a wooden handle. Fresh decoctions are added and boiling continued until the whole mass is reduced to a thick syrup. This is spread on the leaves or poured into rectangular moulds much in the same way as the confectioners make sugar toys. Katha of a blood-red colour is of best quality. As Kuth manufacturers work slovenly, many impurities are left in the commodity sold in the bazar. Betel leaf sellers have, therefore, to boil the whole thing over again to purify it.

Uses.—Catechu is much used for tanning skins, not more than 5 days being required for the purpose.

It imparts a brown dye to cotton. It is much used by English calico-printers. With the salts of copper and sal ammoniac, catechu yields a permanent bronze colour; with protomuriate of tin, yellowish brown; with perchloride of tin and nitrate of copper, a deep brown hue; with acetate of alumina, brown; with nitrate of iron, dark-brown. Catechu has entirely taken the place of madder (*majith*) for dyeing coffee brown. One pound of catechu is equal to six pounds of the root.

TANNIC ACID

Tannin or Tannic Acid ($C_{14} H_{10} O_9$) occurs in the bark of many trees, *e.g.*, acacia, catechu (*khair*), rose-apple, *kachnar*, oak, sismad, etc.; in tea, hops and roman berries. It is a crystalline substance and occurs in gall-nuts, oak galls and myrobalans and unripe fruits. Owing to its astringent properties, tooth-brushes (*datans*) of acacia and *phulahi* twigs are made. The more vigorous a tree and more calcareous a soil, the greater the yield of tannin. Therefore it follows that to get more of tannin from any tree the soil round about it should be manured heavily with chalk or lime. "The proportion of tannin appears to be greatest in bark removed about April or May . . . . . . Tannin is abundant in the leaves of oak, in all active growing parts and in diseased parts like galls. Any irritation to the protoplasm appears to increase the amount of tannin."—*Collins*. Gall-nuts are very rich in gallo-tannic acid, containing sometime as much as 50 per cent. of the acid. The acid is prepared by boiling the bark.

Tannin as found in the liquor produced by steeping the bark, is used for tanning leather, in dyeing and in ink industry. Tannic acid of commerce is obtained from gall-nuts, and is exclusively used for dyeing pale shades of cotton, the acid acting as a mordant. Gallic Acid ($C_6 H_2 (OH)_3 COOH$), produced by boiling its gluco side tannin with dilute acid, occurs in gall-nuts and is a powerful reducing agent. When heated to 215° C., it yields pyrogallol.

The best gall-nuts are imported from Alleppo in Turkey, the second best from China. For extracting tannin or for making inks, galls with holes should be rejected,

and only solid green fruit should be selected. Galls can be cultivated in the Himalayas at a height of three to five thousand feet above the sea-level, but it is a pity that no serious effort has yet been made in this direction and so blue-black ink fetched fancy prices during the second world war.

For Books on Agricultural Science, see Part III.

BASKETS AND BASKET MAKERS

There is a fascination about basket-making which is felt chiefly by those not concerned save as spectators in that ancient and worshipped craft. Baskets are of very ancient date and design. The very basket that is used by the Indian village wife for husking rice is displayed in the bas-reliefs of Assyria and Egypt, dug up in ancient ruins, more or less intact, and found in even older cities than those of Asia. The cradle of Moses was a basket, and it is common Eastern habit, be it noted, to keep infants not in use in baskets. The British cult of baskets dates from Woad and the Phœnicians. If history is to be believed—and there is no reason why Cæsar should tell a lie about it—the ancient Britons lived in enormous baskets turned upside down, and went fishing and coasting in the same right side up. Succeeding civilizations destroyed the baskets but even to this day the finest baskets in the world are made in the English countryside. Wicker-work is still employed for chairs and market baskets, not to mention the daintiness of lunch and needle-work receptacles, but he would be a bold Briton who could settle the housing question with a basket hut.

India has had a flair for baskets from times immemorial. They are used for every conceivable purpose and are of all shapes and sizes. All market produce must be stuffed into baskets. No coolie is complete without a basket, and, as is fitting and right in a country like India, every trade and caste has its own special pattern. We are well acquainted with the egg-man's basket, the baker's basket, the fruiterer's basket, the huge netted basket for ducks and fowls, and the fish-creel. Moreover, shapes differ from Cape Comorin to the Himalayas. The finest basket-work comes from Madras as well as the most original shapes —cones, squares, oblongs of envelope design, as well

as huge round creels. On the Bombay side the work is rougher but strong and durable. The baskets of Bengal have their original side. Splendid bits of basket-work can be found in Bengal, some of which can compete with Madras. Every province, every district in India has its own particular brand. There are the weird Himalayan baskets, *kiltas* and *kundis* which can be used for carrying humanity when other conveyances fail, and at the foot of the Himalayas every valley is full of basket-makers. Kalka is a great basket-making centre. Every Indian passing through Kalka buys a basket. Mounds of baskets lie about the bazar and the railway station, and passing Indian regiments pounce on them. Beautiful baskets are made in the eastern part of the Punjab. There is a specially strong basket made for snake-charmers, warranted proof against the wriggles of imprisoned cobras. Nor must we forget the special basket made for the famous basket trick. Its peculiar shape gives away at least part of the *modus operandi*.

It is a curious fact that the makers of these most useful goods are men of the lowest caste,—Dooms, aboriginals, and gipsies. It is difficult to understand why so clean a craft should be the trade of the low. Basket-making must have been here before the Shastras, like sowing and reaping, and the eternal job of killing. Why did these have dignity thrust upon them, while basket-making was cast down? It is no doubt a loafer's trade. The basket-maker toils when he thinks fit, neither rising with the dawn nor burning the midnight oil; nor is the glamour of warfare his. Therefore in India he sits with the depressed classes. In India proper, away from the Frontier, there are very few Mohammedan basket makers. Mohammedans will make cane chairs and do small things like that, but they do not as a rule make baskets. This leads one to conjecture that basket-making is a truly aboriginal craft, found here in India by Aryan conquerors who thereafter left it for the work of the serf. Baskets then, being low-caste products, must undergo the ceremony of *leepo*, a plastering of mud all over, before they are fit to hold the *bunnia's* stores and the high estates of the mighty.

E. N. in the Statesman.

For literature, study "Basket-making" (*Cassels*).

CHAPTER III

METALS

Iron-ware Mender.—*Ingredients* Sulphur, 2; plumbago, 1.

Process.—Melt sulphur over fire. Add plumbago. Stir well. Pour out in a shallow flat basin. Let cool. Break into small strips. *For use*, place the compound over the crack and solder by rubbing over it hot iron bit.

To Galvanise Iron.—Wash the articles clean with dilute sulphuric acid, 1 part of acid and 84 parts of water, and then immerse in clean cold water. If not sufficiently clean, scrub with sand and water or with bricks and water, and wash with clean cold water. Let the goods be then heated and then plunged into a bath of chloride of zinc. Then it should be plunged into molten zinc several times until the desired effect is had. Then dip in cold water and wipe dry.

AMALGAM FOR MIRRORS

Amalgam for coating mirrors is the completely saturated compound of the two metals, one being mercury, hardened into crystalline form. It is prepared directly upon the mirror plate by the following method :—

A sheet of tinfoil larger than the mirror is placed upon the silvering table which should be quite smooth and flat ; one with a marble top with adjustable screws, fixed to either a horizontal or inclined position serves the purpose best. After the sheet has been spread out and made perfectly smooth with a puff of cotton wool,* a small quantity of mercury is poured over it and evenly distributed by means of woollen cloth. When the whole sheet has been dampened with the mercury more is poured on to make a layer about $\frac{1}{8}$ in. deep and the plate of glass, first thoroughly cleansed (which is best done with strong soda lye or common washing soda), is laid upon it. To do this a strip of paper is pushed in one side, the edge of the glass laid upon it, and the plate is then slowly pushed forward across the table and finally allowed to settle down upon it. The table is now slightly inclined so that the

* Carded cotton is called cotton wool.

mercury can drop off and the plate settle firmly against the amalgam. When the mercury has ceased to run off, except very slowly, pieces of soft, thick, woollen cloths are spread over the plate, and weights are put on it to press out all excess of mercury. At the same time the table is more sharply inclined. The weights may be removed in about 30 hours as the amalgam will have by this time adhered closely to the glass. The plate of glass is set up on edge, and a little more mercury will drop off. In about four weeks the mirror may be considered as finished.

If curved glass plates are to be made into mirrors, convex or concave, the amalgam is made by itself, and after spreading it as evenly as possible upon the plate the latter is heated until the amalgam melts.

N.B.—Great care must be taken to have the plate of glass perfectly clean, as the amalgam will only adhere to a bright surface. The cleaning is best performed by means of washing with strong soda lye. Since the process of making mirrors by reduction of silver solution upon the glass has been known, and can be quickly and cheaply carried out, the use of amalgam is falling more and more into disuse, a desirable condition in view of the fact that the workmen employed must constantly breathe in the fumes of mercury.

Paint for Mirror Back.—*Ingredients:* Red lead, 4; paper varnish, 2; turpentine, 4. Grind finely. Apply two coats at intervals of 24 hours.

Amalgam for Electric Machine.—An amalgam consisting of two parts of zinc and one part of tin may be used for covering the cushions of frictional electric machines. This amalgam is prepared by first melting the zinc and tin in a crucible and adding the quicksilver, previously heated. Rub together all vigorously with pestle and mortar.

Engraving Mixture for writing on Steel.—Sulphate of copper, 1 oz. Sal ammonia, ½ oz. Pulverize separately, adding a little vermillion to colour it and mixed with 1½ oz. of vinegar. Rub the steel with soft soap, and write with a clean hard pen, without a slit, dipped in the mixture.

For Metal Polishes, see Chapter XIV.

Oxidising Steel and Iron.—(1) *Ingredients:*

Bichloride of mercury, 1; chloride of bismuth, 1; chloride of copper, 1; hydrochloric acid, 6; methylated spirit, 5; water, 5. *Process:* Dissolve the above intimately. Clean the required articles perfectly well by boiling in a washing soda solution, finishing by washing with spirits. Then dip the articles into the solution of chlorides or the solution may be spread with a soft brush over the thing in the case of surfaces free from depressions. When dry, boil the articles for half an hour or so in clean boiling water. A very dark colour can be obtained by applying two coats. (2) *Ingredients*: Crystallised chloride of iron, 2; solid butter of antimony, 2; gallic acid, 1; water, 5. Turn into solution. Treat the articles as in (1) above and then dip them into the solution till the required shade of colour has been obtained. Next apply a thin coat of hydrochloric or sulphuric acid. Let stand for full 24 hours. Remove the acid coating with the help of a steel wire brush. Repeat the process several times. Next dip the articles in linseed or turpentine oil and heat red hot. (3) Make a solution of 400 gr. of sodium hypo-sulphate in 2 pts. of water. Rub with fine sand. Repeat till the requisite colour has been produced.

Steel Tools, Preservation of.—(1) In wet places un-electroplated iron tools are soon covered over with rust to great annoyance. This can be prevented by coating them with a solution of white lead in lard oil (*q.v.* Directory). Other fats may be tried with benefit. (2) The tools may be wrapped in papers soaked in sweet oil, the wooden parts being rubbed over with linseed oil. If desired, the tools may then be packed in a box lined with oil paper. Store dry.

Machinery, Prevention of Rust on.—*Ingredients*: Sand free from salt, 16; gum-camphor, 1; transparent resin, 1. *Process*:—Melt the ingredients together; skim carefully, mix by stirring enough of fine powder of graphite till colour of iron is obtained. Clean the machinery; rub it over well with the above mixture. Rub it over clean with a soft cloth. Machinery thus treated will keep bright for many months.

Tinning Copper.—(1) On one side, smear with brine the side that touches the fire. Next with a pad or two sprinkled over with killed-spirit wash the other

side; then sprinkle a little powdered sal volatile over the surface. Heat the metal. When hot enough, rub the surface with a piece of the purest tin. Let a small portion melt. Keep ready a pad of old cotton-wool obtained from old quilts ready with powdered sal volatile sprinkled over; rub the molten tin entirely over the surface. Do this pretty quickly. The superfluous tin may be removed with wadding saturated with oil. (2) *On two sides.* Procure a semicircular, *i.e.*, D-shaped iron bath, built up over a fire-grate. Melt enough quantity of tin in the bath. Prepare meanwhile the copper vessel with killed-spirit and sal volatile as in (1). Pass the vessel through the metal with pincers and remove the superfluous molten tin as in (1). When the whole vessel has been tinned, plunge it in cold water, and scour it up bright by rubbing it over with a mixture of emery and oil with a piece of flannel. After cleaning this, rub with clean cloth.

N.B.—(1) Reject bazar tin with which lead is mixed to increase weight. That gives rise to blackish coating.

N.B.—(2) If the tinning as bright as of fresh kerosene oil canisters be desired, after removal of vessel as in (2) above take off surplus tin, immerse in a bath of tallow or paraffin heated above the melting point of tin. The remelted tin thus spreads over the surface evenly.

For Lacquers, see Chapter XIV.

Ageing Copper Plates.—*Ingredients.*: Liver of sulphur, 4 oz., water, 10 oz. Make a solution. Pumice, sand, or bath brick, *Process.* Let the copper plates be cleaned with soda and soap, and then painted with the above solution. Scour the raised parts of the ornament with sand, etc. Rub with soft cloth or leather. Let alone for sometime for air to act. For further ageing, the plates should be covered over with mould or earth wetted with vinegar and allowed to stand in a shallow box.

Frosting Aluminium.—Let the article be immersed into a strong solution of sodium or potassium hydrate till covered over with fine bubbles. Take out, wash it well. Next dip it in a solution of nitric acid in water. Repeat the process several times till the required dullness has been obtained. Last of all, wash well, and dry in warm saw dust.

CHAPTER IV

BEVERAGES

ESSENCES AND EXTRACTS

For flavouring syrups, etc

For Perfumed Essences, see Chapter XVI.

Almond.—(1) One fl. oz. essential oil of almonds; 1 pt. spirit. Agitate together.

(2) Oil of bitter almonds, 1 oz.; alcohol, 13 oz.; water, 6 oz. If desired, colour with ½ oz. of tincture of turmeric (*haldi*). Used for syrups. The milky colour of almonds syrup sold in the bazar is due to mixture of boiled milk in which some bicarbonate of soda has been dissolved as a preservative.

Anise (*Saunf*).—Alcohol, 500 parts; proof spirits, 300 parts; oil of anise, 100 parts; carbonate of magnesia, 100 parts. Colour with caramel (burnt sugar) q.s. For making *araqs* and for flavouring liquors.

Dose: 10 to 20 mm.

(*b*) Aniseed, 2 oz.; oil of sour anise, 1 oz.; alcohol, 2 pints. *Stimulant, Aromatic, Carminative.*

Apple.—Peel and reduce to pulp 6 lb. unripe crab apples; add 1 lb. iron wire in small coils; digest in a vapour bath for about a week, express, strain, decant and evaporate in a porcelain vessel, with constant stirring to the consistency of a soft extract; dissolve the residue in 4 parts water, strain and evaporate as before.

Banana.—Alcohol, 500 parts; proof spirits, 200 parts; pure banana juice, 190 parts; banana ether, 100 parts; tincture of vanilla, 10 parts.

Cardamom (*Bari ilaichi*).—Cardamom seeds, 600 grams; alcohol, 85% 10·5 litres; water, 5 litres. Used as carminative and for making *araqs* and for flavouring.

Coriander (*Dhania*),—Powdered coriander, 4 oz.; oil of coriander, 1 dr.; alcohol, 24 oz.; water, 8 oz.

Ginger.—Alcohol, 500 parts; proof spirits, 250 parts. Macerate for two weeks; express, and filter.

Ginger, Soluble Essence of.—Take 8 parts of best dry ginger (*batra sonth*). Crush thoroughly; steep in 90% alcohol; strain. Dilute this strong essence with the milk of lime (pure slaked lime, 1 oz.; water,

1 pint) agitating repeatedly till the colour is removed. Filter at once and wash the filterate with proof spirit until you have obtained double the original volume. Then add very carefully dilute sulphuric acid just to remove the dark colour. Dilute with an equal quantity of water and let stand in an ice-chamber for a whole day. Filter bright by means of kieselghur. Instead of slaked lime, barium or strontium hydroxide yield better results.

(*a*) Note.—*Batra sonth*, first class dry ginger, can easily be distinguished from inferior varieties by the rhizomes of the former being free from fibres when broken.

Lemon.—One half lb. yellow peel of fresh lemons; 3 double bottles boiling water; infuse one hour; express the liquor; boil down to 4 seers, cool and add 4 oz. oil of lemon dissolved in 24 oz. spirits of wine; mix and filter.

Lemon, Soluble Essence of.—(1) Add 15 fl. oz. of rectified spirit to each pound of thin peels of lemon. Let stand for a whole month. Press. To each pint of the filterate add 2 fl. oz. of terpeneless oil of lemon.

(2) Oil of lemon, terpeneless, ½ fl. oz.; rectified spirit, 2 parts; lemon yellow colour, just to impart lemon colour.

Mulberry.—Alcohol, 5 parts; proof spirits, 2 parts; pure mulberry juice, 2 parts; mulberry ether, 1 part.

Nutmeg.—(1) Oil of nutmeg. 2 parts; mace (*jawatri*) powder, 8 parts; alcohol, 95%, 256 parts. Dissolve oil in alcohol by stirring the mixture well. Fill in stoppered bottles.

(2) A very good carminative and cordial, if used in small doses: (*a*) Oil of nutmeg, 1; mace powder, 4; alcohol, 95%, 128 parts. Dissolve oil in alcohol by agitation; add mace powder, and macerate for 12 hours, then filter. (*b*) Purified alcohol, 500; proof spirits, 400; oil of nutmeg, 50; carbonate of magnesia, 50. Colour with caramel.*

Orange.—Fresh yellow rind of orange, 4 oz; rectified spirit, 8 oz.; water, 8 oz.; digest for a week;

* Sometimes when hope of life has all but abandoned and legs have become cold and clammy, oil of nutmeg or powdered nutmeg has worked wonders. Tried on person of author during 1918 influenza epidemic.

press, filter ; add 1 quart sherry if you like. *Refreshing.*

Peppermint.—Oil of peppermint, 1 oz.; rectified spirits, 4 oz. Mix colour with tincture turmeric. Used in toothache ; to disguise foul breath ; as flavouring agent ; in flatulence, colic, nausea, sickness, etc. *Dose*: 10 to 30 drops on sugar. Also to make peppermint water, peppermint tablets.

Pistachio (Pista) (Imitation).—Essence of almonds, 2 parts ; tincture of vanilla, 4 parts ; oil of neroli, one drop.

Rose.—Red rose leaves, 2 oz.; oil of rose, 1 dram ; alcohol, 2 lb.

Sandalwood.—Sandalwood oil, 1 dram; rectified spirit, 1 oz. Weaker essence may be made by increasing the quantity of spirit. Excellent for cheering up the spirits.

N.B.—To make any essence, take 1 oz. of any essential oil and add it to a pint of alcohol.

For Essence of Vinegar, see Chapter XII.

SYRUPS

India being for the most part a hot and arid country people naturally require refreshing syrups in hot season while in the Madras Presidency they do so throughout the year. Syrup industry need not be resorted to when the price of sugar ranges very high. In famine time also it should be practised with great caution.

Syrup may be sold wholesale or retail according to the capital one can invest. For the latter, it will be better to make arrangements with some confectioner in the beginning who can supply any amount of syrup of the desired thickness. Syrup insufficiently boiled is soon spoiled, while over-boiled crystallises. Experience will, however, be the best guide as to the exact time when boiling should cease. See below.

Syrup, Clarification of.—For this purpose clean or spring water should be used. Should this be not obtainable, lime water may be employed to dissolve the sugar. Lime water is made by dissolving a little lime in a gallon of water and allowing it to settle, the scum formed being removed and the clear liquid gently decanted. Two seers of water can dissolve about sixteen seers of sugar. On boiling when a black scum appears over the syrup, at first a little tartaric acid,

the so-called (*nimbu-ka sat*) may be added in solution. When the scum grows sufficiently thick, milk and water in small quantities may be added each time before the scum is removed. One tola of tartaric acid for 10 seers of *Desi* sugar is sufficient. For composition of tartaric acid, see *Directory*, Part V.

Syrup, English Method of Clarification of.—This is best done by dissolving the sugar in the water or fruit juice cold, then beating up a little of the syrup with some white of the egg and 1 to 2 oz. of cold water, until the mixture froths well. This must be added to the syrup in the kettle, and when the whole is frisking up to a good froth, heat should be applied and the scum removed from time to time with a clean skimmer (*Hindustanee poni*) As soon as the syrup simmers, it must be removed from the fire and allowed to stand, until it has cooled a little, when it should be again skimmed if necessary and then passed through a clean piece of flannel.

DIFFERENT SYRUPS

Most of the syrups are prepared by the addition of essences (which see above), to which are sometimes added suitable and apposite soluble colours just as are employed by the aerated water manufacturers from whom these may be had.

Violets, Syrup of.—A mild laxative—is prepared by addition of a decoction of violet flowers and leaves strained through a piece of muslin.

Similarly lotus flowers may be employed. Mulberry syrup, useful in sorethroat, is prepared from the juice pressed out from the mulberry fruit. The syrup of almonds is generally prepared by the addition of some good boiled and skimmed milk containing a little carbonate of soda to prevent it from getting sour, and thereafter adding some essence of almonds. Or better use the milk preservatives given in the chapter on Agriculture. Other syrups may be made by the addition of *keora*, rose or other concentrated distilled waters. Perfumed waters or essences should always be added just before bottling when the syrup is quite cold, otherwise much of the volatile scent will be gone. *Sikanjbeen* is made by the addition of vinegar or lemon juice. For medicinal syrups consult *Qarabadeen Qadri or Ehsani*.

SOME ENGLISH SYRUPS

Apple.—Clarify syrup, add equal quantity of big slices of apples, better cored and quartered apples. Boil for a time. Let cool. Pour off the syrup and bottle. The remaining part may be served with bread. *Invigorating.*

Ambrosia.—Vanilla syrup, 1; strawberry syrup, 1. *Wholesome.*

Banana.—Simple syrup, 12 pts.; oil of banana, ½ oz.; tartaric acid, 2 dr. *Nutritive.*

Grape.—(1) Brandy, 5 oz.; spirits of lemon, 2 dr.; tincture of red sanders, 1 oz.; simple syrup, ½ gal.

(2) In season take juice of grapes and to every seer of simple and clarified syrup add 2 chhtks. of the juice. Boil, skim, let cool, bottle. *Strengthening. May be given as nourishment to the patients and invalids like glucose.*

Mulberry.—Fresh mulberries—avoid over-ripe ones—6 lbs., sugar powder, 6 lbs.; Boil both in a kettle till the boiling syrup is brought to 30° B. Pour out into a colander. Let cool. Bottle the strained syrup.

Orange.—(1) Rub 30 mm. oil of orange with ½ oz. of tartaric acid and then add to 1 gal. of simple syrup.

(2) Grate off the yellow rind of select oranges, (Punjab variety to be preferred). Pound it in a good-sized mortar. Add one powa of sugar. Rub thoroughly with a pestle. Let alone for 3 hours. Extract the juice of the pith of the oranges taken. Mix with the above lot intimately so as to dissolve the whole sugar. If necessary, use a little more water. Strain through a sieve with fine meshes or through muslin into a gallon bottle. Add simple syrup to make full gallon. Mix thoroughly. No artificial colouring required.

(3) Fresh oil of orange, ½ dr.; citric acid, 1 oz.; water, 2 oz.; simple syrup, 1 gal. Tincture of curcuma, sufficient quantity. Any other yellow colour for syrups may be used instead. Rub the acid and oil in a mortar. Add water to dissolve thoroughly. Add the tincture. Add to simple syrup. Great demand can be created for this syrup.

Almonds, Syrup of.—Soak 1 lb. of sweet almonds and 1 oz. of bitter almonds in hot water. Blanch. Reduce to a paste in a stone or marble mortar and make an emulsion with barley water. Strain. To each

pound of the paste add 2¼ lbs. of sugar. Boil and add a tablespoonful of orange flower water. Store in air-tight bottles in a cold place. If a little brandy or alcohol be added, the syrup will keep well for a sufficiently long time.

N.B. (1)—The kernel of bitter almonds is pale white. Almonds with hard shells or Peshawar variety are to be preferred. (2) To each bottle of syrup add 1-8 oz. of essence of almonds (q. s.) Add kewra or rose water to taste. *Too much kewra water upsets the digestion.* On the other hand rose water is an appetiser. (3) *For marriage parties and entertainments.* Prepare as (2) above. Add 4 oz. of boiled and strained milk into which ½ tola of sodium bicarbonate has been added. Such a syrup must be used within a day or two.

Demulcent Gum Arabic Syrup.—Dissolve by heat pale and select gum arabic and equal weight of water and add to four times as much syrup. Simmer for 4 or 5 mts. Skim; strain; bottle. *Good for air passages and kidney and bladder troubles.*

Orange Peel, Syrup of.—(1) Fresh orange peel, 1; sugar, 16. Make a syrup with enough water. (2) Tincture of orange peel, 1; simple syrup, 7. *Dose*: 1 to 2 dr. *Very refreshing; anti-scorbutic; good for liver.*

Rose, Syrup of.—Petals of Lahore or Mirzapur or Choa Saidan Shah roses, 8 chhtks.; boiling water, 2 seers. Soak overnight. Filter, reduce to 1 sr. by heat. Add syrup of 3 seers of sugar. When cool, add rectified spirit, 2½ chhtks.

Straight Lemonade.—Citric acid from 1 to 1½ dr.; essence of lemon, 10 mm.; sugar, 2 oz.,; cold water, 1 pt. Dissolve completely by stirring.

Home-made Soda Water.—Carbonate of soda, 40 gr.,; loaf sugar, 6 dr.; lemon juice of half lemon or 50 gr. of tartaric acid. Mix soda in 1 glass of water and the other ingredients in another. Mix both and drink at once. Quantity given sufficient for 4 glasses. For 2 dr. greater quantity of sugar may be taken.

Lemonade for Invalids.—Lemon, deprived of rind and cut into slices should be placed along with the peel into a jug, and some sugar to taste be sprinkled over it. Then pour on to it 2 pts. of boiling water. Cover

well. Let cool. Strain. Reject the lees. Take desired quantity.

Orangeade.—(1) Juice of 4 oranges; thin peel of 1 orange cut up in slices,; sugar, 2 chhtks.; boiling water, 1 seer 12 chhtks. Proceed as the foregoing. (2) Juice and peel of one orange; citric acid, 15 gr.; sugar, $1\frac{1}{2}$ chhtk.; boiling water, $1\frac{1}{4}$ sr. Proceed as No. (1)

Peach Cordial.—Peach juice, $1\frac{1}{4}$ seers; white sugar, $\frac{1}{2}$ seer. Make a syrup. When cold add, 5 chhtks. of best brandy. While drinking dilute with water. The N.W.F.P. and the Chamba Valley grow the finest peaches.

Peppermint Cordial.—Make a syrup of $\frac{1}{2}$ lb. of white sugar with 2 pts. of boiled water. Let cool. Add 24 mm. of peppermint. Bottle warm.

Diabetic Lemonade.—Citric acid, 5 grams.; glycerine, 22 grams.; water 1,000 c.c.

COLOURS FOR SYRUPS

Harmless Colours for Syrups and Wines.—For bluish-red, use black currant, 6708; for brown, caramel; for orange, azo-orange; for red, cochineal, eosin, 19722 or raspberry, red, 45612; for yellow, lemon yellow 19943 or tincture or infusion of saffron and turmeric; for green, chlorophyll will serve the purpose best. By admixture of tincture of saffron or turmeric with a solution of indigo carmine in different proportions all shades of green may be obtained.

Carmine Water for reddening the Syrup.—Dissolve 22 parts of carmine in sufficient strong water of ammonia and enough distilled water to make 500 parts.

Colouring Materials for Beverages.—Aerated waters and syrups are generally coloured with ready made liquids sold in sealed bottles in the bazar. To give yellow or deep yellow colour, caramel is used.

Caramel, Manufacture of.—Dissolve 7 seers of brown loaf-sugar in 1 seer of hot water and boil it in a big kettle till its colour is deepened. Then have slow fire and let the sugar burn "until the smoke makes the eyes water." Continue the process until a few drops let fall into a tumbler, harden sufficiently and crack. Then pour over the solution little by little 4 seers of warm water. Stir all the time. After mixing it well,

filter it hot through a coarse flannel cloth. Take care that the sugar is not over-burnt. The heat applied should range between 221° C. and 204° C. For this purpose a good thermometer may be used.

Caramel is largely used for coloring syrups or to pass it off as storax (*salajeet*)

Lemon Juice, Preservation of.—Lemons are extensively cultivated in the Central Provinces. They cannot easily be carried to other distant provinces with advantage. There is, however, a great market for the lemon juice everywhere, if the juice be extracted in some town in the C. P. and preserved as follows:—

(1) Stir up the lemon juice with talcum powder for a sufficiently long time; filter: add sugar; boil in glazed vessels; fill hot in suitable jars or bottles and seal while hot.

(2) Spread a little sweet oil over the surface of lemon-juice.

(3) The unfermented juice should be heated to boiling point, filtered, and preserved in hermetically sealed bottles.

The fermented juice should be mixed with 10 per cent of alcohol and heated to boiling point in a closed vessel. The alcohol may be recovered as if in distillation.

(4) By means of an aerated water machine, fill the juice in bottles along with carbon dioxide under pressure. The gas will prevent the germs to act. This method may be used for the preservation and bottling of other juices also. The bottles should then be sealed air-tight. Sealing wax or paraffin wax may be used for this purpose. Dip the necks of the bottles in melted wax and then cover them with capsules.

SOME IMPORTANT BEVERAGES

Lemonade Powder.—(1) These powders are far better for moving the inactive liver than the lemonade sold in the bazars. Take tartaric acid, 10 oz.; crystal sugar, 40 oz.; essence of lemon, 1 dr. Mix well; turn over till quite dry. Divided equally into 20 packets. Store in quite dry tin. One packet will make a glass of lemonade. (2) Sodium bicarbonate, 65 grams; tartaric acid. 60 grams; sugar, 185 grams; lemon oil, 12 mm.

Lemonade Lozenges.—Tartaric acid, 10 gms.; sugar, 30; gum arabic, 2; starch powder, 0·5; lemon oil, 6 mm.; spirit of wine sufficient. Make 30 lozenges.

Malted Milk.—Many people cannot easily digest milk because it forms big clots in the stomach. If milk be prepared in the following way and taken in small sips, it is sure to agree with the most delicate stomachs: Add 1 tablespoonful of malt (*q.v.*) to 1 pint of milk and heat milk to 60° F. Bring to boiling point and let it boil for about half an hour.

Health Coffee Essence.—Keeps body healthy and exhilirates. Boil 3 seers of best fried and powdered coffee with 1½ seers of chicory in 18 bottles of water in a covered kettle. Let cool; strain thoroughly. Add enough distilled water to make 18 bottles again; also 6 chhtks. of pure alcohol; 12 chhtks. of glycerine, and enough simple syrup to make 36 bottles. To prepare, mix 1 table-spoonful in a cup of hot water.

Coffee Extract. Moisten 100 oz. of good coffee with a little water. Fill in a glass percolator. Add 10 oz. of good brandy with enough of boiling water to get 300 oz. of extract. Cover tightly; let stand for an hour; percolate.

Coffee (Searl's Patent).—This is prepared by mixing condensed milk with a very concentrated essence of coffee and evaporating at a low temperature (in *vacuo*, if possible), until the mixture acquires the consistency of a syrup (coffee syrup) paste (coffee paste), or candy (coffee candy). The last may be powdered (coffee powder, dry essence of coffee).

See also Coffee Substitutes, Chapter XXII.

Essence of Ginger-wine.—Four fl. oz. of its essence with 2 lb. of loaf sugar are calculated to make 2 quarts of ginger-wine:—Tartaric acid, 4 oz.; capsicum, 6 gr.; strong tincture of ginger, 2½ fl. oz.; soluble essence of lemon, 1 fl. dr.; burnt sugar or caramel just enough to give the desired colour; water to make the whole mixture 6 pints.

N.B.—Much of the so-called "Essence of Coffee" is nothing but treacle and burnt sugar, flavoured with coffee.

Ginger Beer Powder.—Jamaica ginger (*sonth*

batra) in fine sifted powder, 16 parts ; cream of tartar, ½ part ; tartaric acid, 3 parts ; sugar, 6 parts ; oil of lemon, ¼ part. Triturate the oil with the remaining ingredients and pack in 3-oz. packets. In packing use transparent oily paper. Then pack in another white paper which should be lightly gummed and closed. The third cover should be the label paper. When required, a packet should be added to 12 bottles of warm water. Add 1 seer of sugar, and at a temperature of about 100° F. Add a wineglassful of brewer's yeast or ½ oz. of German yeast previously thinned with a small quantity of cold water. Let stand overnight. In the morning take off the scum, let stand for a day and bottle.

Emulsion of Almonds.—(*For Summer Use.*) Take 1 oz. of blanched almonds; ½ oz. of pith of cucumber seeds; ½ oz. of pith of pumpkin seeds ; pepper 20 seeds ; cardamom seeds, 1 drachm. Beat them in a mortar to a fine paste. Strain the mixture through a clean cloth. Add sugar to taste. Such an emulsion is called *thandai* or *serdai*. Very cooling and refreshing ; a good diuretic.

(*For Winter Use.*) Take ½ oz. of pith of blanched almonds, ¼ oz. of pith of cucumber seeds ; ¼ oz. of pith of pumpkin seeds ; poppy-seeds, ¼ oz. ; sathi rice, ½ oz. Beat them to a fine paste in a stone-mortar. Strain. Fry with ½ oz. of pure ghee and boil to a thick paste. When cool add crushed cardamom seeds and sugar to taste. An excellent brain and general tonic, if taken just before retiring to bed, but alas ! good and pure ghee has become a rarity in India.

CHAPTER V

CEMENTS

Portland Cement.—Chalk, or any other rich limestone, 65 to 80%; clay and iron oxide, 20 to 35%. Mix thoroughly with water in a mill. Dry slowly on hot plates. Reduce to fine powder in a kiln. Keep in a dry place for some months before it is used, as by this means the quality of the cement is greatly

improved. When agitated with water, it quickly sets and thus has considerable cohesion which lessens with admixture of sand. If required to coat walls as stucco, mix one part of cement to three or four parts of fine sand, free from loamy particles.

N.B.—Paint should not be applied before several months have elapsed.

GLASS CEMENTS

Glass, Wood or Porcelain, To Unite.—Gum arabic solution strong, 250 oz., to which add 90 gr. alum dissolved in 2 oz. of water. To prevent the gum from cracking or drying, one or two drops of glycerine may be added.

For Porcelain or Glass.—Dissolve cheese in soluble silicate of soda or potash.

German Cement.—*For glass or earthenware.* Fuse together gum shellac, 2 parts ; Venice turpentine, 1 part. When partially cool, make it into sticks. Keep the vessel close while fusing, as turpentine is very inflammable. When required, melt near a gentle fire.

Stick Cement.—Melt together 6 parts of sulphur ; 4 of white Burgundy pitch, 1 of shellac ; 2 each of elemi and mastic ; and 6 of very fine powder of kaolin. Before application, carefully heat the broken parts.

Cement for Delicate Glassware.—Dissolve gelatine, 100 parts in 150 parts of 96% acetic acid. Add 5 parts of ammonium bichromate in fine powder in a dark room. Bottle in amber coloured phials and enclose in dark green covers. When drying mended parts, expose directly to the sun.

Universal Casein Cement.—Will mend nearly anything. Mix together 1 seer of fresh casein with $3\frac{1}{4}$ oz. of quicklime, and 60 drops of oil of cloves. Make into paste with the help of water and use at once. Before use, clean the surfaces thoroughly. Press the broken parts tightly together.

Cement for Ivory.—Place equal parts of isinglass and sheet gelatine in water to soften. Press out excess of water and mix in 1 per cent of mastic varnish. Apply warm.

Cement for Pestle Handles.—Melt together equal parts of shellac, gutta percha and rosin. Dry and warm the parts to be joined.

Cement for Wood and Glass.—Form a stiff liquid by mixing zinc white in copal varnish. Before mixing see that zinc white is quite dry and finely powdered. Then even the most highly polished woods will not be injured.

Zinc white is the same as is used for eyes. Best variety obtainable from Hathras.

Rubber Cement with Leather.—Use a syrup of gutta percha dissolved in carbon disulphide. Rough with a rasp the surfaces to be cemented. Apply the cement. Hold together until set.

Cement for Oil Tanks.—Mix together thoroughly quartz-sand, 2 parts; clean unslaked lime, 2 parts; finely ground litharge or yellow lead, 5 parts.

Cement for mending China.—(1) Make a sticky paste of gum arabic with plaster of paris. Apply it well to the broken parts. Press them together and leave alone till set.

(2) Mix intimately sifted fine plaster of paris with strong solution of alum in water. Make it of the consistency of face cream. This cement claims to set readily and to unite glass, metal, porcelain, etc., quite firmly. Suited better for large surfaces than for small ones.

(3) Apply juice of garlic to the broken edges. Bind firmly. *Not meant for wares for liquids. Tested.*

Cement to join Glass with Iron.—Take gelatine or best English white glue and steep it in water for 12 hours. Drain the supernatant water. Mix with the gelatine one-fourth its bulk of treacle or molasses. Beat slowly until thoroughly incorporated. Add a little glycerine. Before using warm the cement a little.

Cement for Iron.—(1) Get 1 part of sulphur flour; 2 parts sal volatile. Triturate well. Store in a well-corked bottle against moisture. When required, mix 1 part of this mixture with 20 of clean iron filings. Stir whole with water to which a few drops of sulphuric acid have been added. Press the mixture very tightly.

(2) Fire-bricks, 1 part; iron-filings, 4 parts; clay, 2 parts. Powder and mix well together. Add a solution of salt and water. The compound is not affected by heat.

Cement for Oil Lamps.—Water, 5 parts ; rosin, 3 parts ; caustic soda, 1 part. Boil all together, and then mix with half its weight of plaster of paris. Sets in one hour. Useful for mending lamps.

Cement for Bicycle Tyres.—2 oz. rosin ; 1 oz. pure raw rubber ; 1 pint carbon disulphide ; $\frac{1}{2}$ oz. beeswax. Steep the rubber in half of the carbon disulphide for a whole day and night, and then dissolve the rosin and wax in 8 oz. of solvent. Mix both together. Bottle for use.

Cement to fasten Glass on Brass.—Boil together water, 5; rosin, 3; caustic soda, 1. Mix up with half its weight of plaster of paris.

Paper, to cement with varnished surfaces.—Turpentine dissolves the varnish and so allows paper to stick. Use turpentine, 1, with hot glue, 3.

Iron, to cement with marble.—Mix intimately plaster of paris, 30, fine iron dust, 10, sal volatile, 1, vinegar just enough. Use the paste quickly.

Fountain Pen, To cement.—Just cover some gelatine with acetic acid. On the former being swollen melt down with slow heat. Use at once. Bind the broken parts strongly, until set.

Celluloid Cement.—(1) Use solution of scrap celluloid in acetone, (2) Shellac, 1 ; spirit of camphor, 1; alcohol (90%) 3 to 4. Dissolve by stirring. Apply warm. The solution can be warmed by placing the tube in hot water.

RUBBER SOLUTION.

1. The solution of India rubber or gutta percha in chloroform or benzole, frequently required in photographic work, is usually attended with many difficulties and drawbacks so that in nine cases out of ten where the solution is required the experimentalist usually purchases it ready made. Yet there need not be any difficulty felt about the matter. First pure rubber should be obtained. When vulcanized, rubber is perfectly soluble, secondary pure solvents are necessary. Chloroform containing a large proportion of alcohol and water will fail to act even upon the purest of rubber. Again, under the most satisfactory conditions, the action is very slow, and the amount of rubber being capable of taken up is proportionately very small. The plan

usually adopted is to place a large amount of shredded rubber in a bottle, which is filled up with the solvent, and shaken at intervals of a few minutes ; and when the shreds do not dissolve like pieces of sugar the whole should be thrown aside, and the source of error traced. If a small quantity of rubber had been placed in the bottle, and the liquid added, it would be observed gradually to have swelled out very considerably after the lapse of time, and the mixture of the whole would have been easy by stirring with a glass rod or a splinter of wood. The rapidity with which the rubber absorbs the solvent will depend upon its condition ; but the action is never very quick, nor is it in any way similar to the dissolution of a crystal. One cause of the chloroform to act upon the caoutchouc may arise from the presence of alcohol in too great a proportion. Chloroform as sold almost always contains alcohol in small quantity, owing to the fact that when none is present it cannot be prevented from decomposing spontaneously, more especially in light. It is, however, stated that when entirely protected from light absolute chloroform will not undergo decomposition. A solution of gutta percha in chloroform has a use which is not generally known. It forms when carefully made and filtered quite bright, the best possible material for focussing screen. For fine microscopic work it is said by those whose opinions are of weight to be unequalled.

2. Put 100 parts of rubber, 15 of rosin, and 10 of shellac in sufficient quantity of carbon disulphide chloroform, benzol or gasoline.

3. Mix and dissolve 1 oz. of gutta percha pieces and 40 gr. of rosin in 8 fl. oz. of carbon disulphide.

Solvents for rubber.—(Unvulcanized) Naphtha, Benzol, Benzine, Carbon disulphide, chloroform, petroleum, ether, benzaldehyde, camphor, oil of turpentine, all of these form " collodial solutions. The solution should be obtained immediately after mastication. Non-inflammable solution is obtained by dissolving in carbon tetrachloride. The addition of a little acid accelerates the solution. Requires at least 48 hours.

N.B.—Keep away from fire as all the solvents are very inflammable. If heat required, use a water bath.

Chemical Vulcaniser.—Cut 57 oz. of pure raw rubber into shreds and dissolve in 1 gallon of benzine. Add 14 oz. of powdered rosin and mix it too intimately. Dissolve 5 oz. of gutta percha in 4 pints of carbon disulphide. Mix well both the solutions so made. To produce the best effect, keep ready in another bottle 180 grains of sulphur chloride dissolved in 2 pints of carbon disulphide. When a tyre is to be mended, clean the surfaces to be joined with sandpaper and petrol (or alcohol). Apply a coat of the vulcaniser to both surfaces. Allow to stand a few minutes until the shining appearance is gone. Then with the help of a small, thin brush just moisten the surfaces with the sulphur chloride solution and forthwith fit them together. Now let them dry. The cement will at once dry, but proper reaction will require 6 to 24 hours according to temperature, pressure, etc.

Cement for India Rubber.—Mix together 1 part gutta percha ; 2 parts, caoutchouc ; ½ part glue, with 8 parts of carbon disulphide. Apply as is done in the case of cycle tube punctures.

Liquid Glue for sticking wood, porcelain and glass.—(1) Dissolve 18 parts of glue in 48 of water Let stand for several hours. To soften, add 3 parts of hydrochloric acid and 4½ of zinc sulphate. Heat the mixture to 185° F. for 10 to 12 hours.

(2) Add to ordinary glue its volume of vinegar and one-fourth part of alcohol. To preserve, add a little alum.

GLUE, MANUFACTURE OF.

Collect cuttings of hides, skins, tendons and other waste parts of animals from shoe-makers or butchers. Soak well in milk of lime, *i.e.*, water impregnated with lime. Wash well in a stream of water to get rid of lime. Boil the material in water till the desired adhesive strength is obtained, when run off the liquid into a cistern to clarify with powdered alum and remnant lime and other impurities. Before cooling, draw off into moulds and cut off in shreds to dry in the air.

Glue is largely in demand by the printers and carpenters and offers a great scope in almost every town where boots and shoes are manufactured, as the raw material can be abundantly had there.

Strong Glue for General Use.—Take ½ lb. of the best glue, the stronger the better; boil it and strain it till quite clear. Boil also 2 oz. isinglass; mix the two in a double pot, add ¼ lb of brown sugar and boil the whole until it gets thick. Then it should be poured into thin plates or moulds, and when cold you may cut and dry them in small pieces for the pocket. The glue is used by merely holding it over steam, or wetting it with the mouth, a dirty practice though. This is a most useful and convenient article. It is much stronger than common glue. It is sold under the name of Indian glue, but is much less expensive in making and is applicable for all kinds of small fractures, etc.; answers well on the hardest wood, and cements china. It resists the action of hot water and for parchment and paper instead of gum or paste, it is found equally convenient.

Elastic Glue.—Glue is dissolved by the aid of water bath and is evaporated till a thick liquid is obtained. An equal weight of glycerine is added and evaporation with stirring is continued until the remaining water is driven off. Then it is run out on a marble slab to cool.

Fish Glue.—The manufacture of fish glue can pay only in the vicinity of fish-curing stations. Collect skins, bones, etc., of fish. Boil all the soluble material. Strain. Evaporate to a stickly mass. On account of impurities the glue formed may keep a little fluid. All the same it can be used by heating it.

DIRECTIONS FOR CASTING PRINTING MACHINE ROLLERS OF GLUE.

1. Break dry glue into very small pieces or cut it by a pair of scissors if moist; sprinkle enough water over it to make it fairly moist and let it soak for 12 hours.

2. Put it in a steam boiler with 4 ozs. of water to every pound of dry glue. After 2 hours of steam-boiling add 2 ozs. of treacle, molasses, jaggery or sugar to every pound of dry glue and let it boil for another 2 hours.

3. **Stir it well at very short intervals** throughout the procedure.

4. When every piece is completely dissolved and the solution is well boiled and has gained heavy thickness,

cast it in moulds and let the mould rest for 24 hours.

5. Take out the rollers from their moulds, coat little glycerine over them, let them have little airing and put them in use.

MUCILAGES.

Mucilages should be offered for sale in wide mouthed bottles. To prevent gelatinization or scraps being formed, nitric acid, vinegar or acetic acid is added, and to preserve from the foul odour the mucilage may be made in lime water.

1. Make syrupy liquid with clean, white gum arabic. Add a few drops of clove oil and cool for use.

2. Make a paste of 400 parts starch in an equal quantity of water; dilute with 200 parts of water. Add 20 parts of glucose and 10 of alum. Heat the mixture to short of boiling point (195° F.) when it will become thin and transparent. Bottle when cool.

3. Dissolve a solution of 15 gr. alum in 100 drams of dextrine and ½ dram of glucose. Add 1 dr. glycerine, and enough of water to make 2 oz.

Tragacanth Mucilage.—Pulverised tragacanth (*Kateera gond*), 1 oz.; glycerine 4 fl. oz. Macerate the tragacanth in glycerine in a stone or glass mortar (*kharal*); stir the paste into 16 fl. oz. of boiling water.

Gum Arabic Mucilage.—Dissolve 100 parts of gum arabic in 840 of water and 10 of glycerine. Add 20 parts of acetic acid and 6 of alum. Mix well. Let stand; pour through a hair sieve. Very strong.

Stick Mucilage.—For architects, mechanics, artists, drawing-masters, travellers. Ought to take the place of pins. Called also *mouth* or *lip glue*. The purest gelatine should be employed. Dissolve 100 parts of white gelatine, and 50 of crystallised or brown sugar or even molasses in 150 of distilled or rain water by means of a water bath. Continue heating till 200 parts are left, when it should be rolled into sticks. *See also strong Glue for General Use.*

Library Paste.—For mounting photographs. Wheat flour, 1 seer; water, 1 seer; nitric acid, 1 tola; boric acid, 3½ tola; clove oil, 20 drops. Mix well the flour, boric acid and water. Strain. Add the nitric

thickens. When nearly cold, add oil. Water may be added if it gets dry.

Envelopes and Label Gum.—Will stick to any surface. Take 1 part each of gum arabic and starch; add 4 of sugar; water sufficient. Dissolve gum in water; add sugar; then add starch. Boil mixture for a few minutes to dissolve starch. Thin to the desired thickness.

Potato Glue.—If glue or gum be not obtainable boil small pieces of potatoes. When cold, rub it up and down on a piece of paper with your fingers for a few minutes, when it can be applied as glue. This is because potato contains a lot of starch.

Gum for Labels.—(1) Take tragacanth, 1 oz.; gum arabic, 3 oz; water, one pint. Dissolve, strain and add thymol, 14 grains, glycerine, 4 oz.,; and water to make two pints. Shake or stir before using.

(2). Take rye flour, 4 oz.; water, one pint. Mix, strain and add nitric acid (*shore ka tezab*), 1 drm. Heat until thickened and finally add carbolic acid, ten minims; oil of cloves, 10 minums; glycerine, 1 oz.

(3). Rye flour, 4 oz., alum ½ oz.; water, 8 oz. Rub to a smooth paste, pour into a pint of boiling water, heat until thick and finally add glycerine, 1 oz., and oil of cloves, 30 drops.

(4). Dextrine, 8 parts; water, 10 parts; acetic acid, 2 parts. Mix to a smooth paste and add alcohol, 2 parts. This is suitable for bottles of wood, but not for tin for which the first three are adapted.

(5). Macerate 5 parts of good glue in 20 parts of water for twenty-four hours, adding 20 parts of rock candy and three parts of gum arabic.

For Label Varnish, see Chapter XIV.

Water-proof Gum.—(1) White shellac is dissolved in rectified naphtha till the right consistency is obtained. It should be kept away from fire or light. Take two parts of pale glue in 8 parts of fresh skimmed milk; melt and evaporate in a water bath to right consistency. Pale glue, 6 parts; sufficient distilled water to dissolve it, then add 1½ parts best yellow resin and when melted, 2 parts spirits of turpentine. Mix all well together. This should be done in a hot water bath. (2) Take

half a pint of boiled linseed oil and 3 oz. of gum arabic. Put in a saucepan over the fire which must be slow. Boil until it becomes sufficiently sticky. It is almost done in a water bath, as the oil is liable to become ignited. Bottle and it will be ready for use and is impervious to water or steam.

CHPTER VI

BLEACHING AND DYEING

BLEACHING POWDER

Many more Bleaching and Cleaning Recipes will be found in Chapter XIX.

Sale of bleaching powder can be pushed on in textile mills and laundries, where it is largely employed for whitening cotton goods; in armies and municipalities where it is required as a disinfectant for water, etc.

For manufacturing bleaching powder there is required a brick work chamber with walls made out of asphalted sandstone and with two or three glass windows. On the floor is spread good fresh slaked lime in 3 or 4 layers : in order to expose greater surface of lime, it is raked into furrows. *A big stream of chlorine gas produced by the action of sulphuric acid on common salt and manganese dioxide by means of heat is made to enter the chamber from above. The gas being heavy sinks to the bottom, mixes with lime and drives out air from tube at the foot of the walls. When the whole chamber is full of the gas, both the aforesaid tubes are closed. Let stand for 12 to 24 hours. By a mechanical device, the lime should be again and again raked all the while—a harrow worked with a crank mechanically or with hand outside the bleaching powder chamber will do.

N.B.—(1) Too much chlorine should be avoided. As chlorine is a poisonous, pungent and suffocating gas, all traces of unabsorbed chlorine should be eliminated by sifting dry lime on the floor or by passing a current of air. (2) Before letting in chlorine it should be dried by passing it through sulphuric acid. (3)

* Various processes of manufacturing Bleaching Powder are given at full length in the present author's *Industrial and Other Openings for Youngmen*

Bleaching powder thus prepared should be packed in strong and air-tight wooden cases. (4) When required, add a little sulphuric acid to a solution of the bleaching powder when chlorine will be evolved. (5) Only wet clothes can be bleached. The gas has no action on dry stuff.

Bleaching of Cloth.—Make a strong solution of bleaching powder or chloride of lime in water. Let settle. Pour off the supernatant clear liquid in a separate vessel. Add 5% sulphuric acid to clear soft water. Rinse the cloth to be bleached in this acid solution, and then pass it slowly through the bleaching solution. Rinse in water containing a little carbonate of soda to neutralise the remaining acid. In case of there being much colour, the cloth should be allowed to remain in the bleaching powder bath for a longer time. This is the general method employed in the cloth mills, and is excellent for the coarse linen *khadder* bought in the bazar.

Cotton Cloth, To Bleach.—Dissolve 1 lb. of bleaching powder made in enough water. Steam. Divide the liquid in three pails. Wet the cloth with the solution. Leave it overnight. Next morning rinse with water twice or thrice. Mildew will be removed. Brown or white cotton dissolved through any cause will also be equally well acted upon by this solution.

Cleansing Jewelry.—When articles in which no precious stones have been set, *e.g.*, gold or silver chains, are to be cleaned they should be thoroughly washed with a solution of soda in water and soap, and then should be rinsed in plenty of cold water. They should be then dried in a warm place over saw-dust. The same process may be tried with rings or other pieces of jewelry in which precious stones other than pearls have been set, the stones being well cleaned by fine-cut wooden pegs sharpened at the ends. Threads may also be passed through the small openings. For polishing the engraved or chased parts, a watchmaker's soft brush charged with a small quantity of rouge may be used. The unengraved or unchased parts can be rubbed over with rouge and water with naked finger even. To get rid of the rouge sticking in the depressions, plenty of water should be used.

Instead of soda water, prepared chalk may be used with advantage. To clean the stone settings they should be first washed with soda and water, then rinsed with alcohol and dried over slightly warm saw-dust, preferably that of box-wood. Any other white wood free from oily stains may be used instead.

Diamonds may be cleaned with soap and water to which a few drops of ammonia have been added; then rinsed with water, immersed in alcohol for a moment or two, and dried over saw-dust as explained in the previous paragraph.

Ink-stains from Linen or Cotton Cloth, To remove.—The spots can be easily removed by rubbing over them a solution of oxalic acid in water. Another method is to use lemon-juice in which a pinch of common salt has been dissolved.

Ink-stains, to Remove.—Make an intimate mixture of equal quantities of cream of tartar and oxalic acid. Keep in air-light bottle. Make a solution when required. Apply. Wash with dilute hydrochloric acid. Wash with clean water. Apply oxalic acid in a paste form. Restore colour if spoiled with dilute ammonia solution. Oxalic acid and muriatic acid are cheap and easy to remove the ink-stains, but they attack the fibre of the cloth. Thus it is that the *dhobies* often return clothes that wear off soon. To obviate this difficulty, powder finely 2 parts of tartar and 1 part of alum. Apply this mixture wet. Equally useful for removing other stains.

Dry-cleaning a Carpet.—Before using the dry-cleaning method hang the carpet on a strong rope. Keep the wrong side outwards. Let two persons stand on each side and beat the carpet on the right side with bamboos to the ends of which pieces of cloth have been tied to prevent the carpet being injured. When no more of superfluous dust flies, the carpet may be similarly beaten on the right side. Now for dry-cleaning, provide yourself with a number of pieces of dry coarse cotton cloth, some pieces of old flannel or any other rough woollen cloth, one or more large pieces of rough sponges, a pair or more of big scrubbing brushes, a few big tubs or open vessels, a number of nails, and in separate vessels enough of hot and cold water. First of all

remove all the grease spots by soap, with a hard brush and cold water. Dry each part well before taking up the next. If available, a mixture of fuller's earth and powdered gall-nuts in water may be used in the place of soap and, grease spots removed as explained above. As cleaned spots are drying, dissolve pieces of a bar of good soap, *e.g.*, Modi or 501, in two gallons of warm water. About two seers of this liquor may be placed in a separate tub. Scour with a scrubbing brush dipped in this liquor over one square yard of the carpet. Do not use so much liquor as should sink to the back part. This being done, the soap should be removed by means of coarse flannel or sponge, removing the dirt and moisture with a brush. The pieces of flannel or sponge and brush should be rinsed from time to time in warm water. Then with a clean sponge dipped in a part of common spirit and then well squeezed, rub the spirit in the part first cleaned. Before proceeding with the next part, rub dry as well as you can with pieces of coarse cotton cloth. The whole carpet should be cleaned piecemeal in this way.

DRY-CLEANING CLOTHES.

Greasy spots should be removed by using Magic Cleaner on p. 82 infra

To remove Blood Stains from Woollen or other Clothing.—(1) Dissolve a teaspoonful of oxalic acid in a teacupful of hot water. Pour into an enamelled basin, dip the blood stained part in it, rubbing it well in solution. If the stain does not go quite well, mix a second portion of oxalic acid and hot water. Add it to the other, rub the stain a little longer and when the stain has quite disappeared dip the spoilt part into warm water, not very hot. Take care that all the oxalic acid is washed out, lest it should destroy the fabric. Then wash the articles with warm soap-suds, in which a little ox-gall has been mixed. After rinsing thoroughly, press the water out, and while still damp iron on the wrong side.

(2) Dr. Holwig recommends a solution of iodide of potassium in four times its weight of water, but it is too costly an affair.

Old Paint from Clothes, To remove .—(1) Either benzole or disulphide of carbon is great solvent of grease,

etc., but it has no action on old paint. This may be removed by chloroform. Stains of a resinous nature may be removed by applying pure alcohol or industrial methylated spirit with a clean sponge.

(2) Saturate a piece of wadding with rectified turpentine. Lay it over the spot. Press it with a flat iron. Keep it moist for a few hours in this way. Then scrape off the paint. Finish by cleaning with benzine.*

To remove Fruit Stains from a Green Dress.—(1) For all sorts of stains produced by red wine, fruits, vegetables and red ink, wash with warm soap-water or liquid ammonia.

(2) For stains on silk use a little hartshorn or ammonium chloride. For any other material, boil a handful of fig leaves in about a seer of water till reduced to one half. Dip a piece of sponge in this liquor and rub over the stains. When dry, brush the spot briskly.

Black Coat, to revive.—(1) Make a Reviving Powder by dissolving in boiling water one chhtk. of Aleppo galls, 2 chhtks. of logwood, ½ chhtk. of gum arabic. Then add ½ chhtk. of green vitriol. Evaporate to powder. Apply to the coat.

(2) Take galls 4 parts ; powdered logwood, green vitriol, iron filings, sumac, each 1 part ; vinegar, 2 parts. Rub on.

(3) Infuse 1 oz. each of iron filings, copperas (*sabaz kahi*) and powdered logwood, and 3 oz. of bruised galls in 2 pints of vinegar. Apply.

Dry-cleaning Clothes.—(1) Petrol is the best dry cleaner. For setting up a dry-cleaning business, procure two or better three big galvanised tanks, with tightly fitting lids. Fill them half with petrol. Immerse the clothes in the first tank. The dirt will be dissolved, the time taken being proportionate to the amount of the dirt present. Rinse the clothes once or twice, and squeeze out before shifting them to the second tank. The petrol in this tank will further attenuate the dirt. Immersion in the third tank, will give clean clothes. As dirt accumulates, it will settle

* Benzine may also be used but the continuous friction of particles in a large plant is apt to charge it electrically and so give rise to a violent explosion To minimise this magnesium is added

to the bottom and can be removed by decantation. The petrol in the first tank should be replenished from the second tank, and that in the second tank from the third tank. The clothes after squeezing out the petrol should be dried in the open air, if the weather permits, otherwise in closed chambers heated with steam pipes, and provided with fans to remove the fumes as they arise. Petrol being highly inflammable, no light should be allowed to be brought near. The dried clothes should be brushed well and ironed.

Stains that do not go off with petrol may be removed by applying some castile soap dissolved in methylated spirit, and cleaning with another rag dipped in spirit. This will often remove the paint stains also. Turpentine can also be employed. The best paint-remover is chloroform. It can be applied after softening the paint with butter or olive oil. Extreme care should be used in using chloroform as its fumes are dangerous. At any rate the process should be carried on quite in the open.

(2). Make medium paste of fuller's earth with water. Cover the clothes all over with it. Hang them in the air to dry. Then brush off. This will pick up all the dirt and the clothes will appear as good as new.

(3). Light materials should be first brushed thoroughly and rubbed with a clean cloth gently. Lay a thick paste of prepared chalk all over the surface. Hang the clothes in the air for two days in winter or one day in summer. Brush thoroughly ; rub with a clean cloth ; press.

(4). In the case of dark garments, ammonia water may be used. Then dry the clothes and press.

N.B.—For general quick drying in wet weather or damp places, clothes should be tied to thin bars fixed all around a vertical bar which can be rapidly revolved mechanically.

Felt Cap or Fez (Turkish Cap) To clean.—(1) Sponge the cap with pure turpentine or with spirits of chloroform. Either will clean the cap perfectly well. Both being volatile, the smell will evaporate if the cap be let alone. As both the spirits are highly inflammable, great care should be exercised in doing the work away from light and never putting on the cap

till all smell is gone. Chloroform fumes will do no harm if the work be done in the open air.

(2) Get rid of all grease stains by washing in hot solution of soda or sesqui-carbonate of ammonia. Then make a paste of pipe-clay with which has been mixed a small proportion of precipitated chalk. Apply over. When quite dry, rub off and brush well.

(3) Pour a pint of boiling water over an oz. of ammonia. Well brush the cap to get rid of dust, and then with another brush apply hot ammonia water. Last of all swill with clean water.

Hard or Soft Felt Hats, To revive.—(1) Make a weak solution of caustic potash. Dip a sponge and apply over. Rinse well with warm water.

(2) Remove grease spots with turpentine or benzoline. Then make a solution of 1 oz. shellac and $\frac{1}{4}$ oz. spirit black in 8 oz. of methylated spirit. Application of this with camel hair brush or sponge will give a permanent fine black colour. The aforesaid quantity is sufficient for half a dozen of hats.

Silk Hats, To revive.—Wet silk hats should be handled very gently. When sufficiently dry, smooth with a clean piece of silk cloth. Then use a soft brush. Portions sticking together should be just moistened with a sponge dipped in beer or vinegar. Application of chloroform will bring back the original colour.

Hat and Cloth Reviver, To make.—Dissolve one chhtk. of borax and one chhtk. of camphor in 2 seers of boiling water. When cool, add 1 seer of methylated spirit. Pack in attractive bottles and cork tightly. An excellent reviver and cleaner. Apply with a sponge as and when required. Brush when dry. An excellent seller.

Serge Cleaner.—(1) Moisten the serge with a sponge dipped in warm water. Let dry. Apply a soft brush over which a little olive oil has been sprinkled.

(2) Mix together one part of strong ammonia in two parts of methylated spirit. Spread the serge on a flat table. Dip a piece of old flannel or serge into the above solution and rub vigorously over the dirty part. To remove glossiness apply as above a solution made by dissolving a teaspoonful of galls in powder in a cup of hot water.

Cloth-cleaning Blocks.—1. Mix well powdered fuller's earth, 16 parts; turpentine 1 part; salt of tartar, 16 parts; best potash, 16 parts. Turn into a paste with best yellow or curd soap. Cut into blocks and let dry. Excellent for removing grease or paint spots. Apply a piece of wet flannel over the block. Rub over the cloth. Sponge off with clean cold water. Dry with a towel.

2. Dry some fuller's earth till it crumbles into a powder. Add a small proportion of pearl ash. Mix well. Knead into a thick paste. Cut into blocks and dry in the sun. To use, rub the block on the cloth previously moistened.

3. Cut one pound of mottled soap into small pieces and put into a jar, placed over a water bath. Pour over it ½ oz. of liquid ammonia, ½ oz. of nitre, and ½ oz. of paraffin. Keep stirring over fire until melted and thoroughly incorporated, when pour out into a mould. Let cool. Then cut up into desired size of blocks and cakes. To use, wet the dirty spot with warm water, and rub over it the cake. Rub gently. Clean off with cold water.

Gold or Silver Lace, To clean.—Take an old stale loaf of bread. Remove the crumb. Crush it and mix with enough of jeweller's rouge to colour it. Sprinkle the mixture sufficiently over the lace, and rub it in with a piece of flannel. Brush off gently the crumbs, and polish out with a piece of velvet.

New German Bleaching Powder.—Something like the famous German Bleaching Powder may be made with the following recipe :—Mix 124 lb. of boric acid crystals with 39 lb. of sodium peroxide. Stir the whole gradually into 100 gallons of cold water. When the mixture is complete, the liquid is cooled artificially by applying cooling mixtures to the container, until the new compound crystallises out. It is then washed with methylated spirit, and dried at about 60° C. or 140° F. The powder so obtained is a powerful bleach, and is permanent if kept out of contact with organic matter.

Nitrate of Silver or Nitric Acid stains, To remove.—(1) Use iodine, followed by strong rubbing with ammonia solution. (2) Use dilute solution of

potassium permanganate. Then wash with a solution of hypo. Rinse with sufficient water.

Real Cleaning Fluid.—Dissolve by stirring alcohol, 3; bay rum, 1; oil of wintergreen, 1; aqua ammonia, $\frac{1}{4}$; chloroform, 1; sulphuric ether (*q..v*), 1; Let stand in an airtight bottle for 6 hours. Then add 1 oz. of powdered borax and 1 gallon of odourless gasolene.

Embrocation for removing Ink from Writing Desks.—Dissolve oxalic acid or hydrochloric acid in water. Rub the solution over ink stains by means of a sponge. To remove small pits, press wet pieces of paper upon them with hot iron until the mixture is evaporated. A better effect may be produced by pressing papier mache, (*See Chapter on Utilisation of Waste Products.*)

Grease Eraser.—Equal parts of benzine, alcohol, ether. Mix. Dab the spot with a sponge wetted with the above solution. After placing pieces of blotting paper on each side, iron with a hot goose.

DYEING RECIPTES.

Red.—(1) Dissolve 9 lb. of cream of tartar and 8 lb. of alum in required quantity of soft water. Steep the cloth in it and boil over slow heat. When cool, wash with clean cold water. This mordant will help fixing the colour. Now dissolve 24 lb. of madder (*majeeth*) and 1 lb. of chloride of tin in hot water and heat for an hour or so. Strain through a piece of canvas or *dasooti*. Dissolve the sediment in water and soak the cloth in the dye. Let dry, then finish by washing with soap solution.

(2). Prepare arrowroot solution by dissolving 1 lb. of arrowroot or fine corn flour in a quart of water. Boil 16 pounds of water and pour the arrowroot solution into it. Boil for another 15 minutes. Then take off the fire. When cool, strain, and keep it by.

Now dissolve 1 oz. scarlet dye in 5 seers of water. Soak the cloth in it for 15 minutes. Then transfer it into an alum solution and then into the arrowroot solution made above. Take it out. Squeeze out the water gently and spread it out on the line to dry. Avoid shrinkage.

(3). Dissolve 1 chhtk. of carmine in 12 seers of water, and add 1/8 chhtk. of ammonia. Steep the washed clothes in this solution. Rasp them well from time to time. Squeeze out water and then immerse in arrowroot bath (See process No. 2 above.) Spread on the line and let the water drip. Fold it without shrinkage.

(4). Dissolve 1 oz. of pearl ash in 1 gallon of water. Boil the cloth to be dyed in this solution and let dry. Now prepare an extract of gall nuts and steep the cloth in this. When quite dry, soak the cloth again twice in alum solution, then transfer into a decoction of madder.

Pink.—Boil 8 seers of water in an earthen vessel. Dissolve 1 oz. of magenta and continue boiling for another half an hour, then dissolve one oz. of chrome alum in powder. When the liquid has been reduced to one-half, take off the fire. When cool, pour in some vinegar. Steep the clothes in this solution for 6 hours. Wring out, wash with clean water and let dry on the line.

Light Yellow.—Dissolve 1 chhtk. of yellow magenta in 8 seers of water. Steep as many clothes in this solution as can be easily put in. Wring out the clothes after 15 minutes, allowing the coloured water to drip into the dyeing vat. Then add one *powa* of vinegar in the solution, and once more steep the clothes in it. Rasp well and let dry.

Violet.—Dissolve 1 chhtk. of magenta in 6 seers of water, and then add 1/8 chhtk of pearl ash. Steep the clothes in this solution. Wring out the clothes after an hour.

Sky Blue.—Boil in 4 seers of water two chhtks. of fine powder of copper sulphate or blue vitriol. Remove when only 3 seers of water has been left. Add $\frac{1}{4}$ chhtk. of prussiate of potash. When cold, steep the clothes and rasp well. Squeeze out the water and place in a dish. Soak the clothes in a solution made with 1/16 chhtk. of pearl ash dissolved in 3 seers of water. Wring out and let dry.

DYEING SILK

Buff.—Boil 1 chhtk. of annato in 30 chhtks. of water. Add by stirring 2 chhtks. of potash. Soak the

silk in this solution for five minutes. Take out without wringing and let dry.

Violet.—Dissolve 1 chhtank of magenta in 6 seers of water. Steep the washed silk in the solution for quarter of an hour. Take out the cloth, and transfer into another vat containing 6 seers of water in which has been dissolved 1/8 chhtk of American pearl ash.

Black.—Soak half a seer of crushed galls in 5 seers of water for five days in an iron vessel. Then boil to ebullition. When the colouring begins to appear, add 1/8 chhtk. of ferrous sulphate. When the water has been reduced to one half, take off the fire. Strain. When cool, stir in 1/8 chhtk. of pyrogallic acid. Soak the silk in this solution. Rasp thoroughly. Let alone for 10 minutes. Wring out, and let dry. This will impart a fast black colour.

DYEING WOOL

Brown.—Get fine powder of walnut shells. These are generally thrown away as waste, and boil in 6 seers of water. When reduced to one half take off the fire, cool, strain and mix ½ chhtk. vinegar. Steep the wool in it some time. Wring gently. Let dry.

Green.—Reduce indigo one chhtk. with water in a mortar to a paste. Soak the wool in it. Wring out and set aside on a plate. Take half a seer of first class turmeric (*chanwan* variety) in another vessel and grind to a fine paste. Dissolve this in 8 seers of water, and soak the dyed wool in this solution once more for four hours. Wring out gently. Let dry.

DYEING YARN

For 100 lbs. of Yarn.

Red.—Dye with 4½ lb. Primuline, ½ lb, diamine fast yellow A and 20 lb. salt, then diazotise and develop with beta naphthol.

Brilliant Red.—Make the dye-bath with 2½ lb brilliant purpurine R and 25 lb. Glauber's salt, working at the boil for one hour.

Bright Red.—Dye with 3 lb. Bengo purpurine 4 B, 3 lb. Soda and 15 lb. Glauber's salt. This dye may also be used with 3 lb. soap and 14 lb. soda in the bath with equally good results.

Dark Red.—Use in the dye-bath 3 lb. Diamine red 5 B, 2 lb. soda and 20 lb. Glauber's salt, working at the boil for one hour.

SUPPLEMENTARY

Blankets, To wash.—(1) Use soapnuts. Make a powder of the rind. Dissolve, and immerse the blanket overnight. Rinse in the morning. Wash with two, three waters. Do not squeeze. Spread on the line to dry. (2) Take a large tablespoonful of finely powdered borax and one pint of soft soap into a big tub of cold water. When completely dissolved, immerse a pair of blankets. Let remain for a whole night. Then rinse with 2 waters and spread on the line to dry without squeezing.

Cotton, To bleach.—First fix and preserve the colour as follows: *French linen*; Immerse the fabric in a strong bath of tea. *Calicos (Chhintz) of pink or green colour:* Put vinegar in rinsing water. The colour will become bright, *Purple and blue*; Use washing soda for rinsing water. *To set colours before washing*: Put a spoon of ox-galls in a gallon of water. Dissolve and soak the cloth in this solution. *Black Cloth*: Put a teaspoonful of lye in a pail of water for rinsing. *Linen*: Proceed as for cloth but the raw colouring matter presents great difficulty.

Clothes, Bluing for.—Dissolve 1 oz. of soft prussian blue in 2 bottles of soft water: then add $\frac{1}{4}$ oz. of salts of sorels. One teaspoonful will do for a large washing.

Chemical Dirt Annihilator.—Ammonia water 2 oz., soft water 40 fl. oz., niter 1 teaspoonful, shavings of soap, 1 oz. Dissolve all thoroughly. This preparation is the last word on grease and dirt removing. If it does not succeed, nothing else may.

Washing compound.—Crude Potash, 2 lb. Ammonium chloride; 1 oz., niter $\frac{1}{2}$ oz., rain water or soft water, 12 bottles. For 8 gallons of washing water, 1 pint of above solution and 1 lb. of soap will do. Soap the clothes in the washing water so made in a tub and keep overnight. In the morning rinse the clothes and wash with two waters.

Magic Cleaner.—Will remove all kinds of grease and oil spots from all kinds of dresses, from carpets.

without injuring the fabrics. Can be used as a charming shampoo and will lather in proportion to the dandruff and grease in the hair. If a piece soaked with the cleaner be rubbed over the door knobs, window sills, etc., all traces of grease will be removed. Hard and dried paint spots will yield to this magic cleaner. It kills bed-bugs in no time and so will prove a good seller in wet places where wood enters largely in buildings. It has no equal in cleaning silver, brass and copper. *Ingredients,*—8 oz. phials, ½ gross ; ammonia, ½ gallon ; soft water or rain water, 4 gallons ; white castile soap (dry and brittle enough) 1½ lb. ; nitre, 3 ozs. *Process :*—Add water to fine shavings of soap. Boil. Dissolve completely by boiling. Let cool. Add nitre slowly. Stir the whole of it until it has been intimately dissolved. Then strain. Let stand. Let the suds be precipitated. Take off the dry suds from the top. Add ammonia. Bottle and cork. In case it may be too thick, add water to dilute it. *How to use.. For removing grease spots.* Apply on both sides of the fabric. Rub hard with a sponge. Use sufficiency of the cleaner. *For carpets and coarse fabrics.* Proceed as above, but use a stiff brush, wash with cold water. The carpet should be thoroughly beaten as described elsewhere in this chapter. Repeat the process if necessary. *For fresh spots,* one application may do, old and dry spots may require a second and third application. *For Shampooing,* dilute a small quantity of the cleaner with equal quantity of soft water, and apply with a stiff brush so as to give a hard rubbing to the pores of the scalp. Wash with the cold water. The hair will acquire a silky gloss. *For silver, brass and copper wares,* mix a small quantity of the cleaner with whiting. Apply with a piece of cloth. Rub hard. *For bed bugs,* apply to the joints and cracks, in the furniture. They will soon run away.

CHAPTER VII.

SOAP AND SOAP POWDERS.

Conversion of Oil into Soap.—Oil being light does not dissolve in water. On the other hand should water contain an alkali, the oily matter forms a solution

with the alkaline water giving rise to emulsion. On boiling this emulsion for some hours it becomes clear forming a solution of soap. If at this point common salt be added, a candying is produced, the curd rising to the top. If this be collected and pressed, we form soap. The remaining clear liquid contains glycerine. For manufacturing hard soaps, caustic soda is used; for soft soaps, caustic potash.

London Soap Powder for Hard Waters.—Mix intimately 6 parts of yellow soap, 3 of soda crystals, 1½ of pearlash (made by burning pearl shells), 1½ of sodium sulphate, and one of cocoanut oil. Spread out to dry. Make a coarse powder.

Pearl Soap Powder.—Curd soap powdered, 4; sal sada or ordinry washing soda, 3; sodium silicate, 2. Treat as above.

Floating Soap.—Good oil soap half cwt.; water, half gallon; melt by the heat of a steam or water-bath in a pan furnished with an agitator, which must be worked vigorously till soap has at least doubled its volume. Then put into the frames, cool and cut into pieces. It lathers well and is very pleasant. Any scent may be added.

Soap Powder.

(1)	Soda ash. 58% ..	42 lb.
	Silica	22 ,,
	Castile Soap	25 ,,
	Salt	10 ,,

The ingredients are mixed in a specially adapted mixer for heavy material, dried and then run directly into the crusher and pulveriser in which it is automatically packed, sealed and boxed.

(2)	Soap	85 lb.
	Filler . ..	40 ,,
	Salt Soda Solution .. 20° B. ..	17 ,,

The dried soap chips are mixed with the filler and alkali, and then pulverised. After this it is automatically packed, sealed and boxed.

Sunlight Soap, A Near Approach.—Procure cuastic soda (98 degrees), 5 seers; water, 30 seers; mahwa oil, 27 seers; cocoanut oil, 3 seers; rosin 1¼

seers. The caustic soda forms a hard lump in the barrel, To obtain fine powder, beat the drum in the sides, remove the lid, when powder can be had.

Heat the boiler on moderate fire with caustic soda. Stir well. As soon as the soda has been dissolved and the solution is sufficiently warm, add the oils. Let gentle heat be continued for half an hour, when stir in the rosin powder. Go on agitating the liquor till it has the consistency of thick honey. This will take another 20 minutes. Remove from fire, and continue stirring till cold. Cut into cakes by means of a fine wire and stamp if desired. The caustic soda shall be of Bull mark. Cuastic soda of 77 or 78 degrees can also serve the purpose.

Perfume and colour should be mixed as the boiler is taken off the fire.

POLISHING PASTE.

Dissolve two parts of castile soap in 3 of boiling water. Add in fine powder, 4 parts of precipitated chalk; 3 of French chalk; and 2 of tripoli. Mix and add water to the desired consistency.

DEPILATORY SOAPS.

(*Hair Removing Soaps*)

(1) Powdered wheat starch, 20 parts; water, 120 parts. (2) Sodium sulphate, 34 parts; barium sulphide, 34 parts; water, 180 parts. (3) Cocoanut oil, 36 parts; glycerine, 21 parts. Dissolve the powdered starch in 120 parts of tepid water, in one vessel, and set aside for use when wanted. (1) In a second vessel dissolve the sodium sulphide (crystals) and stir it and barium sulphide into the 180 parts of water, (2) Add the glycerine. In another separate vessel melt the palm oil. To mix the compounds, make the sulphide solution (2) boiling hot, stir up the starch solution (1), and then gradually stir it into the sulphide solution; (2) keep stirring until the starch thickens; add the melted oil, mix all well together, and add any perfume *e.g.*, citronella essence, or oil of lavender. Before the mass cools and solidifies, pour it into china pots or wide-mouthed bottles or into the desired molds.

Direction for use: Rub the soap into the hair to be removed until the hair loses its crispness and fila-

mentous form, and becomes soft like a pulp ; then wash the parts well with water, and the hair will be removed. Should the skin smart or pain after applying the soap, rub a little olive oil or vaseline or even sweet oil, but never *karwa* oil.

Depilatory Soap.—The soap prepared by any one of the following formulas is well adapted to remove hair:—Glycerine 453 grms., fat 907 grms., cocoanut oil 907 grms., and castor oil 1844 grms. are saponified with 1814 grms., 33 per cent. caustic potash lye ; the soap is then filled with 113 grms., and 907 grms., sulphohydrate of sodium, and performed with 113 grms. citronella oil,

N.B.—Depilatory soap or Paste is more useful than Depilatory Liquid.

COMMON SOAPS.

Laundry Soap.—This soap is prepared by the cold process. Melt 112 lb. of lard by gentle heat and half the lye prepared by dissolving 50 lb. of caustic soda. Agitate well without allowing the mixture to boil, and when it is thoroughly mixed, the remainder of the lye is gradually introduced. The temperature is kept under 149° F. When the paste has sufficient consistency and has no greasy feel when pressed between the fingers, it may be pressed into the frames. The desired perfume is added while the soap is in the pasty state. In about 2 days it will become sufficiently solid to be cut into tablets and pressed. The soap is very hard and of a brilliant whiteness.

Pale Soap.—Cocoanut oil, 50 lb. ; tallow, 25lb.; castor oil, 25 lb. ; caustic soda lye at 70° Be., 63 lb.

Transparent Glycerine Soap.—(1) Fresh tallow, 20 lb., and best cocoanut oil, 10 lb. are heated at 167° F. On the other hand 15 lb. of solution of caustic soda 40° Be. or Specific Gravity 1.834 ; 12 lb. of 96 p.c. alcohol, 15 lb. of glycerine, 6 lb. of brown sugar are mixed together with 2 lb. of water and likewise heated to 167° F. and the mixture gradually mixed with the former under brisk stirring. Saponification takes place in this manner without the necessity of boiling. The reaction is accompanied by a considerable increase in bulk. It may be now covered and after it has a little cooled it may be scented. Finally it is poured into

molds which must be so placed as to prevent soap from congealing quickly.

(2) Dry bar soap 100 lb. to be heated and melted. Then pour 25 lb. more to the melted caustic soda or sal soda. Stir at low heat. Then add 100-125 lb. of glycerine. Agitate, keeping up moderate heat. Let settle. Draw off in soap molds. When cold divide in bars or cakes.

Bitter Almond Soap.—Pure white soap, 1,000 parts; oil of bitter almonds, 12 parts. No colour required.*

Cocoanut Oil Soap.—Place in a soap kettle equal quantities of cocoanut oil and caustic soda lye of 27° Be. Boil and mix well for an hour or two, until the paste slowly thickens, all the time agitating so that at last a white half solid mass is obtained on being cooled.

Essence of Soap.—Take white soap made from any vegetable oil, 6½ oz.; alcohol of 85%, 1 quart; potash 5 dr. Place shavings of soap in a 2 seer bottle. Add alcohol and potash. Heat gently without boiling over a water bath. Agitate with a glass rod. When mixed thoroughly, remove from water bath, and add oil of geranium, 1½ dr., oil of verbena, 2½ dr. To colour, 2½ dr. of saffron may be added.

Extract of Soap.—Soap, 14.3; washing soda, 30; water, 55. Soda crystals and soda soap may be taken.

Honey Soap.—Curd soap, 90 parts; potash soap, 9 parts; oil of citronella, 1.5 part. Melt together. Add a little quantity of burnt sugar for colouring. For genuine honey soap, 10 parts of honey may be substituted for potash soap.

Lemon Soap.—Take white soap, 50 lb.; starch, 2 lb. Add oil of lemon, 4 oz.; oil of bergamot, 2 oz., oil of lemongrass or citronella 2 oz.; oil of cloves, 1 oz. Colour with cadmium yellow.

Soap without Boiling or with Cold Process.—Make a lye of 10 lbs. of double refined 98 per cent. caustic soda powder with 45 lb. of water. Agitate a little once or twice when it will become quite hot. Let cool. Weigh out 75 lb. of oil. Pour the cold lye in a small stream over the oil, agitating all the time

* Addition of nitro-benzol instead will also give satisfactory results.

with a wooden stirrer about 3 in. broad. Continue stirring gently till a honey like appearance is obtained. Do not stir too long. 15 to 20 minutes' agitation will do according to the weather. Dampen the sides of an canister and drain off the liquid soap. Place in a warm place. In winter wrap the canister with old blankets or *tats* (hemp matting) or old quilts. Next morning you will get a block of 130 lb. of soap which can be cut into desired cakes with a wire. Too much stress cannot be laid on taking the ingredients exactly in the same proportion as given above. If grease or tallow is used instead of oil, it must be first thoroughly purified. By adding a few drops of essential oil just when the mixing is complete a toilet soap is obtained.

Use of Linseed Oil in Soap Making.—Linseed oil is easily saponified by boiling with either caustic soda; it requires for complete saponification 19.00 to 19.50 per cent of its weight of caustic potash or 13.6 to 13.9 per cent of its weight of caustic soda. With potash it produces a soft soap, clear and transparent, of brownish yellow colour, possessing a peculiar smell, and having good detergent properties. The properties of alkali and oil being carefully regulated, the soap may be obtained in a neutral state. With caustic soda, linseed oil forms a reddish coloured soap of a buttery consistency. For this reason linseed oil is rarely used in making any of the ordinary domestic hard soaps, although it does find its way into a few special soaps.

With linseed oil nearly all the soft soaps of commerce may be made. For this purpose no better oil can be used. A linseed oil soft soap is of a good bright appearance, pleasing in colour. This is not the case with some other oils which are for making soft soaps. The soap retains its consistency for a long time.

Beware buying linseed oil. Most linseed oils retailed in the market contain an admixture of gingley oil.

Colouring for Soap.—(*For* 130 *lb. of soap*) ½ oz. of potassium bichromate dissolved in a lye gives green colour; 1 lb. of palm oil melted with tallow or oil, a yellow colour, ½ lb. of burnt sugar dissolved in a pint of water added to the melted tallow before mixing, a brown colour.

To deodorize Fat for Perfumed Soap.—Make a solution of 5 oz. of common salt and 2¼ oz. of powdered alum with 28 lb. of water, with which boil 80 lb. of fat for 10 minutes. Drain off the water. Let stand for several hours before using.

Plastic Soap.—Take cocoanut oil, 23 lb.; tallow, 442 lb. caustic soda, 35° Be. 302 lb.; sodium silicate, 233 lb. Whole, 1,000 lb.

Mix the melted tallow and oil at 112—118 deg F. Mix the caustic lye and sodium silicate at room temperature. Run the lye and silicate into the fat whilst the latter are being rapidly agitated. Continue this until the mass is firm enough to retain mark. By taking white grease in the place of tallow a cheaper grade soap may be had.

MEDICATED SOAP.

Camphor Soap. 1.—Soft camphor soap is made by dissolving 10% of camphor in melted "soft soap" It is used as a salve for sores etc.

2. Add crushed camphor, 2 oz. to 4 oz. of cocoanut oil. Mix well. Add the mixture to 6½ lb., of white curd soap.

3. **Milled Camphor Soap.**—Add to 25 lb. of white stick soap 2 lb. of camphor finely powdered (preferably dissolved in spirit) and incorporate thoroughly in the melting machine. Cut the soap into tablets and wrap tightly in glazed paper and tinfoil, otherwise camphor being volatile, the quality of soap will suffer in course of time. Camphor soaps are used for chilblains and for rheumatic pains.

Carbolic Acid Soap.—(1) Take 20 lb. of half made cocoanut soap. Melt 1 oz. of crystals of carbolic acid. Mix well. Add 2 oz. of oil of lavender and 1 oz., of oil of cloves.

2. Melt rosin curd soap in about 2 per cent of carbolic acid in crystals. Place in a frame, and when cold cut into tablets. Press in the mould like ordinary toilet soaps.

Carbolic soap is germicidal and is extensively used for skin diseases. It is an excellent disinfectant for washing the hands after handling doubtful things.

Neem Soap.—Neem soap is excellent for skin diseases. Make a lye of caustic soda by dissolving 1

seer of alkali in $1\frac{3}{4}$ seers of water. Pour this in a stream into a mixture of 4 seers of cocoanut oil and $2\frac{1}{2}$ seers of Neem oil, (made by pressing the neem seeds). Add green soap colour. Mix well with a muller for about ten minutes. Fill in the moulds, and when sufficiently tough, cut into blocks. Any perfume being added will be wasted.

Addition of a certain percentage of carbolic acid will improve the medicinal value.

VARIOUS SOAPS.

Shaving soap.—Place 3 lb. of cocoanut oil, 9 lb. of castor oil or refined and bleached cotton seed oil (either will do) in a pan and raise to 120° F. Make a solution of 2 lb. of caustic soda in 2 qts., of water and heat this separately to 80° F. Gently and slowly pour the solution into the oil and go on stirring to mix intimately. Keep up a temperature of 70° F. to 80° F. for a day and a little over. This can be secured in India by storing the mixture in a cool room and in winter by keeping it in a warm room. Thermometer must be used from hour to hour. In case the temperature goes down, saponification will not occur.

Shaving cream.—Make a solution of 1 lb. of caustic soda in 4 qts. of water. Melt 4 lb. tallow, 1 lb. palm oil in a big pan. Boil slowly and steadily and add the soda solution to the oil. Go on stirring till a little of the mixture taken between fingers along with a little water appears to be soapy and shows no greasiness. Let cool, and when thin enough, fill into collapsible tubes. Too thin paste should be boiled once more to bring it to the required consistency; too thin diluted with a modicum of water and again boiled. Before filling, any perfume may be added.

Resin soap for water-proofing.—Dissolve 1 lb. of washing soda in 2 gall. of water. Boil with it 2 lb. of fine powder of pale resin. Add it to the ordinary soap solution with a mixture of alum solution. A hard resinate of alumina being formed, it will take a better gloss than when only the ordinary alumina soap is used.

Windsor soap.—(Brown). Add to each of the 80 lb. of prepared soap, burnt umber (see Directory) 8 oz.; English vermillion, 2 oz., lampblack, 1 oz.; oil

of cinnamon, 4 oz; oil of bergamot, 4 oz.; oil of caraway, 3 oz.; oil of thymes, 3 oz.; oil of peppermint, 3 oz.; oil of cloves, 3 oz.; oil of lavender, 4 oz.; Mix thoroughly.

Shaving soap.—The shavings of good white soap, 6 lb.; cocoanut oil soap, 2 lb., rain water, $1\frac{1}{2}$ lb; soda, 2 oz. In an earthern vessel carefully melt the soap. Apply gentle heat. Add oil of lavender, 60 mm.; oil of lemon, 40 mm.; bergamot, 50 mm. Mix intimately and put into cup form moulds or in sticks.

Mottled soap.—The process is easier described than actually performed. *Begin on a small scale* (1) Take 11 parts by weight cocoanut oil, and melt with half as much cotton seed, stearin or tallow, Heat very gently. Raise the temperature to 100 F. which is just equal to human blood heat. Go on stirring well, during which time add 12 to 14 parts of caustic soda lye of 65° Tw. at a temperature of 70° F. but only by degrees, Mix intimately. Then pour into moulds. Let stand for 60 hours before cutting. *To colour the soap*, an easy way is to put the colouring matter in a canvas bag and to pass it through the liquid soap from side to side in the mould. For grey colour 15 parts of ultramine should be mixed with 2 of lampblack.

Bouquet soap.—(1) White curd soap, 320, oil of bergamot, 2-2/3, oil of cloves 1/32; oil of neroli, 1/32; oil of sassafras, 1/48. (2) White castile soap, 5 lb.; oil of English lavender flowers, 1 dr. citronella, $1\frac{1}{4}$ dr. oil of bergamot, 2 dr.; oil of lemon. 2 dr.; cocoanut oil, 1 lb.; with gentle heat melt soap and cocoanut oil. Let cool to softness. Add scents dissolved in alcohol.

Cinnamon soap.—Tallow soap, 28; cocoanut oil soap, 14; oil of cinnamon, 6 oz.; oil of sassafras, 1; essence of bergamot, levigated yellow ocher, 1.

N. B.—If desired, bark of *tejpat* may be taken instead of cinnamon.

Mercury soap.—Beat in a wedgewood mortar castile soap, 32, with perchloride of mercury dissolved in 4 parts of alcohol. Mix intimately.

Alabaster soap.—Ingredients.—Stearin, 13; cocoanut oil, 22; glycerine, 13; soda lye (38° Beaume) 18; alcohol (96%), 26. Heat stearin and oil with lye to 178° F. Mix well by stirring. Add alcohol, and

last of all glycerine, on the solution becoming clear, let it cool to 133° F. For scenting, use 1/8th part of oil of the bergamot, 1/32 of oil of geranium, 1/16th of oil of neroli, and 1/32 of oil of lemon.

Windsor soap.—Colour 12 lb. of white curd soap and 8 lb. of cocoanut oil soap with 6 oz. of yellow ocher and when intimately mixed, perfume with 3 oz. of oil of cinnamon, 1/2 oz. of oil of sassafras and ½ oz. of oil of bergamot.

CHAPTER VIII.

CANDLES.*

Candle Making.—Candles have been made since times immemorial. At first they made candles with tallow. In the Middle Ages wax began to be employed for this purpose. The discovery of mineral wax or paraffin has now developed the industry of candles very much. Paraffin has a low melting point (100° F. to 140° F.) This is why the paraffin candles do not tolerate the heat of the Punjab plains, in spite of the fact that stearic acid is mixed with them to prevent them from bending. The better grade candles are made from ceresin—a mineral obtained from ozokerite. It has a higher melting point, *i.e.*, 130° F. to 170° F. Candles of the very best quality are made from spemaceti. The wicks are specially woven from cotton for this purpose. The wicks being plaited are pickled in a bath of borax, 1 part ; and water, 100 parts ; and then dried in a steam heated chest. After that they are wound round bobbins. These bobbins are placed under hollow cylinders, which support candle moulds in a water box. By means of a handle all the cylinders can be raised up or lowered. In the side of the water box there enter two pipes, one for hot water and another for very cold water. On the opposite side there is a third pipe for waste water. The wicks pass through the cylinders and through the candle moulds and are held in position by a special device. Over the broad mouths of the moulds there rest the shallow tray holes to allow

*The subject of candle-making has been fully developed in our future volume, "Industrial and Other Openings for Youngmen".

melted wax or paraffin to pour itself into the moulds.

The paraffin is melted in a steam-jacketed vessel separately. Pails of melted wax are then taken out and poured over the shallow tray. The water in a water box referred to above is at first hot but when the wax has been poured in, the cold water pipe is opened and the cold water is allowed in quickly to solidify the wax. As soon as this has been done, the candles into the moulds are raised up by means of the cylinders, fresh portion of the wicks rising up from the bobbins to take the place of the wicks already used. The wicks are cut and the moulds freshly charged, and the process repeated. Each time the melted wax has done its part the excess wax is scraped from the tray and restored to the melting pot.

The stearine used by candle-makers is a mixture of stearic acid and palmitic acid obtained from tallow. 5 % of paraffin is mixed with the stearine to prevent it from crystallising.

Materials for Candle-making.—Paraffin, bees-wax, spermaceti, free fatty acids like palmitic and stearic, ozkorite; certain esters of the fatty acids, *e.g.*, tallow and waxes.

Wicks for candle-making should be as already explained of plaited or twisted cotton, usually flat, exception being in the case of tallow candles when they should be round. They should be so made that in burning the end should curl over and there need be no necessity of snuffing.

To colour Candles.—*Blue:* use Prussian blue, indigo, copper sulphate or aniline blue; *Red,* use carmine, alkanet root (*ratan jot*), vermillion (*saindoor*), aniline, red. *Yellow,* chrome yellow. *Green,* mixture of blue and yellow colours. *Purple,* or *Violet,* mixture of blue and red colours.

Glycerine Candles.—Dissolve 5 parts of colourless gelatine (*musaffa suresh*) in 20 parts of water, adding 25 parts of glycerine, and heat until a perfectly. clear solution has been formed. Add to this 2 parts of tannin dissolved by heating in 10 parts of glycerine. A turbidity is produced which should vanish on further boiling. Continue boiling until the water has been driven off. These candles are as clear as water,

burn quietly, and without spreading any disagreeable odour.

Admantine Candles.—Mutton tallow, 100 lb.; camphor, 2½ lb.; alum, 2 lb. These candles are hard and are calculated to burn slowly.

Solid Lard Candles.—Cut 16 lb. of lard in small pieces, put in a pot with ½ lb. of alum and half lb. of saltpetre (*shora*), previously dissolved in 1 part of water over a slow fire. Stir constantly over a slow fire until all the lard is dissolved. Allow to simmer until the steam ceases to rise. Then remove from the fire. These candles are harder than those made from tallow.

Stearine Candles.—These are made from the stearine of stearic acid, obtained from tallow, in the same way as other moulded candles. They furnish a superior light and burn a long time. See above, Candle-making, last paragraph.

Coating with a Hard substance.—Dip the Candles in the following three mixtures successively.

(*a*) White rosin, 4 parts; good tallow, 88 parts; camphor, 6 parts; stearic acid, 20 parts; dammar rosin, 2 parts. Melt.

(*b*) Tallow 40 parts; camphor, 6 parts; stearic acid 20 parts; white pitch 4 parts; dammar rosin, 10 parts. Melt together.

(*c*) Stearic acid, 20 parts; white wax, 4 parts; tallow, 10 parts; camphor, 6 parts. Melt.

Wicks.—To improve the light and prevent the tallow, from running, use the following preparation; Boracic acid, 2 lb.; water, 10 gallons.

BLEACHING WAX.

Apiculture or bee culture offers large possibilities of development, especially where there is an abundance of flowers naturally or artifficially grown in the neighbourhood, from which flowers the bees collect honey and wax. Artificial honey-combs of aluminium and wood, or of wood are being used by the Germans, and by Chamba State in the Punjab.

Let wax be melted in a jar. Mix nitrate of soda (*kalmi shora*) 1 oz. to every pound of wax taken. Later on add 2 oz. of sulphuric acid mixed with 10 times as much water to every pound of the wax taken, all the

while stirring and keeping the wax warm. Let stand for sometime. Fill up the jar with hot water, and then let cool, when the wax should be washed with plenty of water to remove any traces of nitric acid. The wax thus prepared is quite white.

The process of bleaching beeswax is not very costly, as it is whitened chiefly by the influence of the sun and weather. Cut up the wax in thin flakes, spread over coarse cloth or sacks, stretched on frames high above the ground. Turn over the wax frequently, and if there be no rain or bad weather, sprinkle with soft water. Continue for about a month.

The above process can be hastened if melted wax and steam be passed through long pipes and thence into a pan heated by a steam bath where it should be quite agitated with water and then allowed to settle. Repeat this thrice and then subject the wax to the aforesaid action of the sun and weather.

Bees-Wax To bleach.—Just melt the wax in a copper vessel over a water bath. Remove it from the fire. Then sprinkle over the wax few drops of oil of vitriol (in proportion of 1 chhtk. of sulphuric acid to 27 seers of wax). Cover over, and then let it settle. Then skim with a big hot spoon or *karchhi* and put into vessels to cool, Thereafter put it in thin flakes in the sun and air, occasionally turning over until completely bleached.

For Bleaching of Paraffin, see chapter on Oil Refining.

For Paraffin see Techno-chemical Directory, Part V.

Paraffin Wax, To harden.—Melt the lot. Mix by stirring stearic acid, carnauba wax, cerasin, or resin. When using the last, melt it before incorporation.

White Wax, To mould—Melt and mould into sticks or cakes. Store in a moderately warm place cut up by means of wire used by soap-makers. For colouring, use oil soluble aniline dyes.

Grafting Wax.—Melt together, in a metal pot resin, 1, beeswax, 1, tallow 1, Use slow fire. Stir well. Let cool. For application, warm the composition a little.

CHAPTER IX.

ELECTROPLATING AND BATTERY PREPARATIONS.

This is a vast subject and we cannot do more than lay down the general principles on which electroplating depends. The electroplator requires in the first place some such electric battery as Bunsen's, Daniel's or Laclanche's, the method of charging which are different and are explained at some length under the Section of Laboratory Receipts. It is, however, supposed that the reader knows how to charge a battery.

The first essential for electroplating is to clean the vessel thoroughly by immersing it in some such acid solution as follows :—

	Metal	Water	Nitric	Sulphuric	Hydrochloric
(*a*)	Copper & Brass	100	50	100	2
(*b*)	Iron	100	3	8	2
(*c*)	Iron cast	100	3	12	3
(*d*)	Zinc	100	..	10	..
(*e*)	Silver & Gold	100	10	..	..

Divide the solution into two parts. Dip the object successively into the two. As the solution grows weaker, it may be reserved for the first bath. Subsequently the object must be thoroughly washed with water. Lead and tin cannot stand the acid bath : they should be cleaned with caustic soda. To avoid oxidation of the surface of the object, it should be at once proceeded with to be electro-plated.

Only well cleaned surface can be properly electroplated. Contact with soiled hands should be always avoided. The objects after they have been cleaned should be handled with clean forceps or tongs.

The dipping process should always be performed in the open air, as the fumes given out are very irritating to the lungs. The acid mixture should be kept in glazed earthenware and covered with a stout piece of glass.

For nickel-plating of iron, it should be first freed from the oxide or the black surface by immersing it in a cold solution of 1 lb. of sulphuric acid and 6 bottles of clean water, with 2 oz. of granulated zinc for about 20 minutes, whereafter scratch the surface with a hard brush.

Always remember to pour a fine stream of *acid on water* and *not water on acid*, all the while agitating the solution with a glass rod. Want of precaution in this respect may injure the operator.

After the article has been prepared as above, it is ready to be immersed in the solution called electrolyte. The piece of gold, silver, tin etc., which is to be deposited on the object should be attached to the positive pole or wire of the battery—that which is connected with the carbon or copper plate—while the object itself with the negative pole which is in most varieties of batteries a zinc rod.

For depositing the metals given black in type hereinafter the solution indicated against it should be used.

Aluminium.—Copper can be electroplated from a dilute solution of the double chloride of aluminium and ammonia, or hot solution of 50 parts of alum and 300 of water, with 10 of aluminium chloride, and when cool add 39 parts of cyanide of potassium. Use a weak current.

Brass-plating.—Take 12 parts of cyanide of potassium; 610 of potassium carbonate; 48 of zinc sulphate; 25 of copper chloride; 305 of ammonium nitrate; 5,000 of water. Dissolve cyanide in 120 parts of water; the next three in the remaining water, raising the temperature of the last to 150 F. When all of them have been dissolved, add ammonium nitrate, stir well, and when this also dissolved, let stand for a few days. Use clear liquid as electrolyte. The loss of the bath so prepared should be made up by the addition of zinc sulphate and copper chloride and a little arsenious acid dissolved in fresh cyanide and water.

If the deposit be too red, use more battery power, or add more zinc salt; if too white, decrease the current, or add more copper salt. The specific gravity of the bath may vary from 5 to 12. When it is more than this, more fresh water should be added. If the deposit be irregular, remove object, mix with water, scratch with brush, and replace in the bath. Repeat this once or twice until satisfactory results are obtained. An operation of 20 to 30 minutes in the above bath is generally sufficient.

Copper-plating.—This is of great commercial value, for copper plating is used not only in making

blocks but also in nickel-plating on iron. If iron be first plated with copper, it always gives good results. Prepare the bath thus. Form a paste of copper acetate crystals ($3\frac{1}{2}$ oz.) with water; stir in carbonate of soda crystals ($3\frac{1}{2}$ oz.) with a little more water, then bisulphate of soda (3 oz.), and lastly the cyanide of potassium pure ($7\frac{1}{2}$ oz.) to make the whole solution 1 gallon. Soft water should be employed. The solution so made should be colourless; if not, add cyanide of potassium until it is so. Hot or cold bath may be used. Attach a large plate of clean or bright plate to the anode or positive pole. When the liquid becomes coloured, more of potassium cyanide should be used.

Gold-plating.—Hot bath gives better results. Small jars should be employed; well enamelled vessels also answer the purpose. Gold is best deposited on silver or copper. Other metals should be first copper-plated as indicated in the previous section. For the foregoing use a strong current and a bath at 170° F., while for German silver, have a weak bath barely warm. If only some parts of the ornamental work are to be goldplated to the exclusion of others, the latter should be painted over with the following rouge: melt thoroughly 10 parts of clear rosin, 6 of yellow beeswax, 4 of best red sealing wax, with gentle stirring and 3 parts of peroxide of iron added. This kind of article should be placed in a bath when the paint is absolutely dry and hard.

Bath for gold-plating on Aluminium.—Gold-chloride 2 parts; potassium cyanide, 2 parts; sodium phosphate, 2 parts; distilled water, 100 parts.

On Brass.—Dip the object for an instant in a mixture of equal parts of sulphuric and nitric acids with a little common salt; remove, and plunge in cold water. Rinse once or twice in fresh water. An immersion of one or two minutes in any one of the following cold baths is sufficient; (1) Dry gold chloride, 1 part dissolved in 160 parts of water. Make the solution clear by the gradual addition of carbonated alkali dissolved in distilled water. Use immediately. (2) 1 gram chloride of gold; 4 grams of hyposulphite of soda; distilled water, 1.76 pints. (3) Dissolve pure pot, cyanide $3\frac{1}{2}$ oz. in a little of water. Add gradually

$3\frac{1}{10}$ oz. of gold chloride in one gallon of water. Mix and boil for half an hour. Let cool. Use as cold. The solutions may be kept in a wooden box.

If the process is slow, add a little more of gold chloride. Perform the process slowly. By taking out the object frequently, scratch out with a brush any irregular deposits.

Hot Bath for electro-gilding on Silver, Copper or any alloys richly containing these metals.—Take distilled water, 1 gallon; crystals of sodium phosphate, $9\frac{1}{2}$ oz.; sodium bisulphite, $1\frac{3}{5}$ oz.; pure pot, cyanide, $\frac{1}{6}$ oz.; gold chloride 160 gr. Heat a little of water and dissolve sodium phos. Dissolve in another portion of water, sodium bisulphate, and pot. cyanide. In the remaining water, dissolve gold chloride, stir the solution gradually into the cold sodium phos. solution and last of all the cyanide and bisulphite. The bath should be now colourless.

In all cases, agitate the object all the while. The gold piece should be attached with a platinum wire to the anode before immersion. The strength of the hot baths can be kept up by addition of gold chloride. On removal of the electro-gilded object, it should be rinsed with hot water, and dried in hot sawdust.

Nickel-plating.—The object to be plated must be properly rinsed with a strong, hot aqueous solution of caustic potash, and after rinsing of the alkali with water, any adhering oxide should be removed by an acid bath. In the case of copper, brass, or German silver, it should be scoured with fine pumice stone and strong aqueous solution of pot. cyanide. Iron is best dipped in dilute sulphuric and hydrochloric acid (acid 1 part to water 5 to 15 parts) and scoured with fine white silicious sand or pumice stone. The object after being rinsed should be quickly placed in the bath but during no part of the process should it be handled. The bath may be prepared thus: (1) Double sulphate of nickel and ammonium, 10 parts; refined boric acid $2\frac{1}{2}$ to 5 parts; water, 150 to 200 parts (2) Acetate of nickel, $2\frac{2}{3}$ parts; acetate of calcium $2\frac{1}{2}$ parts, To each gallon of the solution, 1 fl. oz. of acetic acid should be added. The acetate of nickel is prepared by pouring over nickel acetic acid gradually till effervescence

ceases. The acetate of calcium is prepared, by pouring acetic acid on calcium carbonate (marble pieces) in the foregoing manner. The two solutions should be then mixed, and then the remaining amount of water and the free acid should be added.

For nickel-plating of Cast and Wrought Iron and Steel: Dissolve 10 parts sulphate of nickel and ammonium; 2 of sulphate of ammonium; in 250 of boiling water. Let cool. **For Brass, Tin Copper, Lead, Zinc etc.**—The same as above but take water 300 parts.

To coat old work. whose nickel plating has been worn out, the object should be stripped by a mixture of 16 lb. of sulphuric acid, 4 of nitric acid, and 4 pints of water. See hints about mixing of acids above. The article to be stripped should be tied with a strong copper or brass wire and placed for a few moments in the bath. As soon as the article presents a smooth surface, it should be placed in cold water.

Silver-plating.—The articles to be plated should be first cleaned by boiling them for a short time in potash water, rinsed, placed in dilute, nitric acid and again rinsed with water. Before placing the object in the bath dip it for a second or two in strong nitric acid or strong sulphuric and nitric acids (equal parts), rinse quickly, dip momentarily in dilute aqueous mercury nitrate solution, and rinse again. The bath is prepared by dissolving 5½ oz. of nitrate of silver in enough of soft water free from salt etc., and adding to it with constant agitation hydrocyanic (prussic) acid until all the silver has been precipitated as silver cyanide which can be easily distinguished by the absence of any white cloud on a drop of acid being poured into the solution. Do not put in more of acid. Strain it through white cotton cloth, washing the precipitate with pure water again and again. Dissolve 8 oz. of pot. cyanide (pure) in one gallon of soft water, and stir in the silver cyanide from the cloth. If a free mixture is not obtained, add a little more pot. cyanide. On the precipitation of the impurities, the bath is ready for use. A weak current from 12 to 15 hours gives very good results.

N. B. All cyanide compounds should be kept under lock and key for they are deadly poisons.

PLATING WITHOUT BATTERY.

Nickel-plating on Iron or Steel.—Make a 10 % solution of pure zinc chloride. Add nickel sulphate solution sufficient to produce a green colour. Boil in porcelain vessel. Do not mind any sediment that may be left. Rinse the articles to be plated free from grease or soap. Suspend the articles in the boiling solution for 30 to 60 minutes. Remove. Wash in thin chalky water and dry. Polish with chalk.

Gold-plating.—Dissolve by gentle heat 2 *mashas* of pure gold in 8 *mashas* of hydrochloric acid and 3 *mashas* of nitric acid, and so by evaporating practically all the acids make gold chloride. Add a little water and precipitate the chloride with ammonia. Wash precipitate with water. Dissolve pot-cyanide (90 %) 100 *mashas* in water just enough to dissolve it. Incorporate with this the chloride made above. Finally put in more water to make 200 *mashas* of the solution. This is a very poisonous solution. Use similar to above.

Silver-plating.—Dissolve 20 grams of pure silver in 60 grams of nitric acid. Add a little water and precipitate with 20 grams of caustic potash dissolved in 50 grams of distilled or rain water. Collect silver nitrate so formed. Wash. Dissolve in a solution of potassium cyanide (92 %) 100 grams made in as small quantity of water as possible. Finally add water enough to make 2,000 grams. A poisonous solution. Does not give as good results as plating with battery. Use as above.

Gold-Plating without Battery.—Get fine plates or leaves of gold. Dissolve them in aqua regia made of nitric acid 5 parts, ammonium chloride 2 parts and saltpetre half part, in a flask. When all the gold has disappeared, pour the contents into a flat-bottom stone or enamelled jar. Into this liquor steep squares of linen cloth in sufficient number one upon the other one by one. Strike them with a glass rod so that all the squares should absorb the liquor equally well. Then take out each square by means of wooden pincers. Spread them in a dark chamber to dry. Drying in lighted place will turn the colour of the gold chloride

sucked up by the pieces of linen from the liquor When almost dry, support these pieces on glass rods and place them over charcoal fire just as in roasting meat. On account of the presence of nitre, the pieces will catch fire. Remove the burning pieces to marble slabs and let the burning be complete. Collect all the ashes that drop in course of burning. Grind finely the ashes by means of a muller and place them between parchment leaves around which wet cloth has been folded. The powder is now ready for use.

Mix a small quantity of the powder with a few drops of water on a slab and rub this paste well on cleaned surface of silver to be plated. Smoothen surfaces with the thumb and pits with a fine cork cut to proper shape, and the corners with a stick of soft wood as of lime, poplar or *partal*. The articles are then to be burnished with a jeweller's sponge or with the burnishing machine. The burnishing forces the thin layer of gold into the ornament or the article that is being plated and so the plating is sufficiently resisting. To produce a red shade, add a small quantity of copper to the aqua regia while making the plating powder.

Nickel-plating without battery.—Make a strong solution of zinc chloride, dilute with equal quantity of water in copper or procelain plating vessel. Heat to boiling. Add sulphate of nickel little by little till the solution turns green. Then add a few pieces of zinc clippings and a small quantity of powdered zinc. Boil the articles to be plated in this solution for 20 minutes to deposit the nickel. Take out the articles, wash them with water, and when dry burnish them in the usual manner.

Silver-plating without battery.—Get a small quantity of silver nitrate. Neutralise it with common salt until no further white precipitate is produced. Use rain or distilled water. Let the precipitate settle. Pour off the supernatant water, and collect silver chloride deposited at the bottom of the vessel. Add thrice as much washing soda and $1\frac{1}{2}$ times as much common salt as the weight of silver nitrate taken. Make a paste with this preparation with warm water. Apply the paste as above to perfectly clean wares.

TABLE OF BATTERIES USED BY ELECTRO—PLATORS.

Name of Battery	Negative Element and solution.	Positive Element and solution	E M F of cell	Approximate Resistence of each cell.	Work for which it is most suited
Daniel	Copper in saturated solution of sulphate of copper.	Zinc in sulphuric acid solution, 1 to 12 or 20.	1 079 volts	2 to 5 ohms	Electro-gilding, silver plating and elecro-typing.
Smee	Platinised silver in dilute * sulphuric acid 1 to 10, 15, or 20.	Zinc in dilute sulphuric acid 1 to 10, 15, or 20.	0.47 volts.	0 5 ohms.	Electro-gilding, silver plating, and electro-typing
Walker	Platinised carbon in dilute sulphuric acid, 1 to 10, 15 or 20	Zinc in dilute sulphuric acid 1 to 10, 15 or 20	0 66 volts.	0 4 ohms	Electro-gilding, silver plating, and electro-typing
Bunsen	Carbon in nitric acid.	Zinc in sulphuric acid solution 1 to 15 or 20	1 7 volts	0 8 to 0 11 ohms.	Nickel-plating and copper-plating in alkaline solutions.
French Bunsen.	Carbon in strong sulphuric acid.	Zinc in sulphuric acid solution 1 to 15 or 20.	1 6 volts	0 11 ohms	Electro-gilding, silver plating copper plating, in alkaline solutions and nickel plating.

* 1 to 10 means 1 part of acid to 10 parts of water.

E. M. F. i.e. Electromotive force. The unit is volt, *i. e.* a unit of pressure which when steadily applied to conductor whose resistance is one ohm will produce a current of one ampere.

Ohm, the unit of electrical resistence of conductor to a steady electric current by a column of mercury 14·4521 grammes in weight at the temperature of mercury of a constant cross sectional area and 106·3 cm.

Ampere is the unit of steady flow of current which when passed through a solution of silver nitrate in water deposits silver at the rate of .001118 of a gramme.

SOLUTIONS FOR BATTERIES.

For Bichromate Cell.—(*a*) Dissolve 2 oz. of pot. or sodium bichromate in 16 fl. oz. of water to which add 3. fl. oz. sulphuric acid, (*b*) Dissolve 16 oz. commercial chromic acid in 129 of water and add 10 of sulphuric acid.

(*c*) 12 parts by weight of hot bichromate dissolved in 150 parts of water with the addition of 25 parts of sulphuric acid.

For Grove or Bunsen Cell.—Dilute sulphuric acid with 6 times as much water for the zinc elements. For the platinum or carbon elements, use nitric acid. As by the evolution of nitrous oxide, the nitric acid becomes weaker and weaker, it should be stored separately.

For Daniel Cell.—Use dilute sulphuric acid for the zinc element and copper sulphate solution for the copper element.

For Minotto Cell.—(Used for telegraphic work on Indian railways), In a glazed jar, a copper disc is placed at the bottom, covered over with pieces of copper sulphate, cloth or thick blotting paper, saw dust or clean river sand, cloth and blotting paper in succession. The copper disc is connected with the pole wire. In the middle of the top blotting paper, a zinc rod with broad base is placed, and the empty part of the jar is filled in with water.

For Smee's Cell.—Use dilute sulphuric acid, (1: 8). The zinc rods should be occasionally re-amalgamated.

For Volta's Cell.—Dilute sulphuric acid (1: 6). The zinc plates should be re-amalgamated and the bubbles of hydrogen brushed off the copper plates occasionally. It is seldom used nowadays.

For Leclanche's Cell.—'Each element of this battery consists of a rod of carbon placed in a porous pot which is then tightly packed with a mixture of pyrolusite (peroxide of manganese and coke.) The porous pot is contained in an outer vessel in which is the electropositive metal zinc. The exciting liquid is a solution of sal ammonia.'—*Ganot.*

De La Rive's Floating Battery.—This is floated over dilute sulphuric acid (1: 6).

Dry cells, Renewal of.—Remove the card board container. Bore about 20 holes with a bradawl in the zinc covering. Place the jar in a solution of ammonium chloride and let remain there for several hours. After a good deal of the solution has been absorbed, take it out and put it by to dry. Then plug the holes with candle wax and replace the cell into the card board container. The strength of the remaining solution may be reinforced with a little more of sal ammoniac and used for further cells. Very cheap. A large measure of the current will be restored to the exhausted cell.

CHAPTER X.

GLASS.

Etching and Graining upon Glass. Smear the surface to be etched with asphaltum varnish. Dig out the letters or designs on this varnish with a fine pencil, taking care that the letters or designs are free from asphalt. Round the whole design or the surface to be etched make a wall of melted beeswax,* so as to prevent acid from running out when poured in. As this is ready, place the glass flat, and pour hydrofluoric acid into the carvings. Let it work for an hour. All this while the glass should not be touched or moved. Then pour off the remaining acid into the bottle, which is always of gutta percha, for future use. Wash

* See also Etcher's Wax

the glass with a little water, and scrape off the wax and keep it for further use. Remove the asphalt with sharp penknife. The design is ready.

To etch on druggists' bottles or jars, when the design has been made as above and a wall of wax made, lay the design face downward on a sheet of lead and press it against the design so as to encompass the wall of wax. Then introduce a hole into the wall in one corner and pour in acid as usual and let it work.

Glass Grinding for Signs, Shades etc.—Glass can be ground with fine emery powder with the help of a little water. If two plates are to be ground, both of them may be placed against each other, having the emery powder in between them. In the case of other articles the emery should be ground with a piece of cloth. Very, very fine sand will replace emery.

Hydrofluoric Acid for Etching.—This acid can be prepared by pulverising fluorspar and dissolving it in sulphuric acid. This acid is a deadly poisonous liquid. It is colourless and volatile, and the vapours should not be inhaled. Fluorspar is generally colourless, but sometimes of yellowish or greenish hue. It is often found in lead or tin mines, also in granite, limestone or slate mines. The acid is stored in lead or gutta percha bottles, and can be had ready made from science goods dealers.

Etching on Glass.—Coat the surface with melted beeswax or paraffin, the former being better. Make any design or figure, lines, letters or monograms with pin point or a stylo. Place some fluorspar in a lead tray and moisten it with sulphuric acid. Apply gentle heat and let the design be exposed to the fumes of the hydro-fluoric acid so evolved.

The divisions on tubes etc., are etched by exposing the designs to the action of dry sand projected from a cylinder by means of steam or current of air with the pressure of bellows of an enameller's lamp. The cylinder is provided with a nozzle or spout with several holes.

Black Etching for Glass.—Finely powder equal quantities of ammonium fluoride and barium sulphate. Mix with hydrofluoric acid to a thin paste in lead tray by means of a lead pencil. The ink may be preserved

in gutta percha tubes or in bottles coated inside with melted paraffin. To write on glass, use a lead pencil.

Writing on Glass.—(*a*) Silver nitrate, 3; gum arabic, 20; distilled water, 30. Dissolve gum in 29 parts of water, and the silver nitrate in the remaining 10. Mix and add the required colour. Bottle in green phials. This ink can write on ivory also. (*b*) Shellac, 20; alcohol, 150; borax, 25; water, 250; water soluble colour, sufficient, any. Dissolve shellac in alcohol and borax in water; pour gradually the former into the latter, to which add the colouring matter previously dissolved in a little water.

For Writing with a Common Steel Pen.—Ammonium fluoride, 10%, barium sulphate, 30%; water enough. The mixture should be semi-liquid.

Frosting Glass.—1. Place some sand on the glass and rub it over with a muslin bag containing fine sand, powdered glass and water.

2. Apply with a brush a solution of 2 tablespoonfuls of magnesium sulphate dissolved in 1 part or less of beer.

3. Paint with a brush a mixture of sandarac, 18 dr.; mastic, 4 dr.; ether, 24 oz.; benzine, 16 to 18 oz.

4. Get a lead trough of the desired size and depth. Dilute hydrofluoric acid with water and get it of the desired strength. First lay a piece of glass on the solution to test if the acid has been properly diluted. Then lay the article to be frosted on the acid into the trough for a short time and as the proper amount of roasting has been done, take it off and wash it with water. Let not the acid touch the hands as it is very active and may injure your skin.

5. Another way of frosting is to make a saturated solution of alum in water, and wet the glass to be frosted with this liquid. Place the glass in a horizontal position so as the solution may not drain off quickly. Let it cool slowly. The glass may be gently warmed for this purpose. A good quantity of the solution will give bigger crystals. To have pinkish or reddish hue, the solution may be coloured with cochineal.

6. The best way of frosting is by the sand blast process. The glass to be frosted is placed before the nozzle of a tube, the nozzle being perforated sand is

forced through it at high pressure and projected on the surface to be frosted.

7. Temporary frosting may be produced by coating the glass with semi-transparent varnish.

Ink for Glass.—Take bleached shellac, 10 parts; lamp black, 5 parts; and dissolve it in venice turpentine, 5 parts; and oil of turpentine, 5 parts, over a water bath.

Lettering Glass. See *Etching glass* above.

Sketching Paper.—To prepare it, equal parts of bleached linseed oil, turpentine and balsam of fir, each are taken and mixed. Paste or thick gum solution is applied to one side of a frame of a lesser size than the paper to be prepared. The paper moistened in clean water is laid upon the frame. The paste holds it firm. It is then coated with brush, saturated with the above mixture. Three or four coatings will do, giving after each process time to dry before applying the next. Then it may be used for sketching like the glass in the 'Oriental Painting.'

Paints on Glass, To transfer.—Take of gum sandarac, 4 oz.; mastic, 1 oz.; venice turpentine, 1 oz.; and alcohol 15 oz. Digest in a bottle, frequently shaking and it is ready for use. *Directions.*—Use, if possible, good plate glass of the size of the picture to be transferred, go over it with the above varnish, beginning at one side, press down the picture firmly and evenly as you proceed, so that no air can possibly lodge between; put aside and let it dry perfectly, then moisten the paper cautiously with water, and remove it piece-meal by rubbing carefully with the fingers. If managed nicely a complete transfer of the picture to the glass will be effected.

Gilding Glass.—Paint the part to be gilded with a saturated solution of borax. Place gold leaf on this prepared surface and by means of a clean cotton piece press the leaf evenly and firmly. Heat the glass gently and carefully over a spirit lamp until the borax melts. Let cool.

For Decoration of Gold Letters and Designs.—Apply with a brush a solution of sodium silicate over the parts; place the gold leaf as above; partially dry the object by warming at about 136° F. and by means

of a lead pencil, draw the designs over the gold leaf; trim off the edges of the leaf, and dry the object at a higher temperature.

To render Glass Opaque.—Paint the glass with the following solution; Zinc sulphate, 3 parts; magnesium sulphate, (Epsom salt) 3 parts; dextrine, 2 parts; water, 20 parts. Mix. On the mixture being dry, the glass becomes translucent.

Painting on Glass.—Melt clear rosin, 1 oz. in an iron vessel; let cool a little when add sufficient oil of turpentine to keep it liquid. When cold grind colours in oil, and mix.

Silvering Glass.—(*a*) Nitrate of silver, 1 oz; water, 10 oz. (*b*) Caustic potash, 1 oz.; water 10 oz. (c) Glucose, ½ oz.; water, 19 oz. The above quantities are those estimated for 250 sq. inches of surface. Add ammonia to solution (*a*) till the turbidity first produced is just cleared; now add (*b*), and again ammonia to clear; then a little solution, drop by drop, till the appearance is decidedly turbid again; then add (c), and apply to the clean glass surface. A film is usually obtained in 43 minutes at a temperature of 56° F.

Another Process.—Dissolve 120 gr. of silver nitrate in 2 oz. of distilled water, and pour this solution quickly into a boiling solution of Rochelle salt in about 2 oz. of water. Now make a separate solution of 120 grams of silver nitrate in 2 oz. of distilled water, and add ammonia until the precipitate is nearly redissolved. Make up to 24 fl. oz. with distilled water. For use, mix equal quantities of the two solutions just before the silvering is to be done.

Solution for Silvering Glass.—Pass absolutely dry ammonia gas through pure aldehyde until saturated. Dissolve 2.5 grams of this in distilled water. Also 4 grams of pure silver nitrate. Mix both and add water to make 1 litre. Filter. Clean the glass thoroughly so as to be quite free from grease or soap. Immerse it in the above solution and heat to 50°C. or 152°F. When a thick coating has been obtained, remove. Wash and dry.

Mirror-back Protector.—Make a mixture of 4 oz. of finely ground red lead, 2 oz. of paper varnish, and 4 oz. of turpentine. Apply 2 coats at interval of 24 hours.

Glass Polish.—1. Cocoanut oil soap, 20 oz.; tripoli, 2 oz.; 1 oz. each of alum, cream of tartar, white lead powder. Water enough. Mix well soap with water until a specimen taken on a glass rod sets on cooling. Add the powders finely ground and thoroughly mixed. Pour into shallow moulds to cool. For use, wet the glass with warm water, smear evenly with the above soap, and polish with a dry soft cloth.

2. Soft soap, 1 part; methylated spirit. 16 parts.

Transferring Photo to Glass.—Steep the photo prints in a solution of white wax made by heating it in a dish or plate large enough to hold the print while transferring. Apply the print when the glass is warm. Press the print on the back to squeeze out all air bubbles. Put the surplus wax quite over the edges. When cold and quite dry rub the print down very carefully with extra fine pumice-stone and paint over with oil paint.

Glass or Sand Paper.—The fragments of broken wine bottles, etc., are carefully washed to remove dirt, the glass is crushed under a revolving stone, and sifted into six sizes as in manufacturing emery in just the same manner as wheat is crushed into ordinary flour and then into *maida* of various degrees of fineness. The sifting is done through wire sieves which are generally cylindrical like the bolts of flour mills. The cloths have from 60 to 90 wires to an inch. A surface of thin glue or *suresh* is spread over fairly thick paper generally used as covering for the school note-books, but of inferior quality, and the powdered glass is dusted over it with a sieve.

NOTE,—Glass can be very easily crushed by heating it and then dropping it in cold water.

Lamp Chimneys, To prevent from breaking. Put them on a fire, in a vessel filled with cold water, and a little coarse salt, heat gradually, until it boils, and then cool slowly. The process may be applied to objects of crockery or procelain. In this way the objects are annealed, and the slower the operation, especially in the cooling of water, the stronger will they become. If a glass chimney is cut with a diamond on the convex side it never will break, for the cutting

facilitates the dilatation produced by the heat. On cooling, the cut portion will return to its normal position; only the scratch will be seen.

For Composition of Glass, see Techno-Chemical Directory, Part IV.

CHAPTER XI.

HOUSEHOLD REQUISITES.

CHEWING GUMS AND CONFECTIONARY

Sen-Sen.—This is prepared in the U. S. A. from gum chicle which is obtained from a large Mexican timber tree by a process similar to the extraction of rubber. The vernacular names of chicle are: Hindi and Bengali, *Sapota ;* Cambay, *Chikail ;* Tamil *Shimai eluppai ;* Telugu. *Sima-ippa ;* Kanarese, *Kumpole ;* Burmese, *Twottapat.* In America, the manufacture of this gum is confined to a limited number of firms but it is sold everywhere in novel ways.

(1) Soak 56 parts of gum chicle in sufficient quantity of water until no more of water can be absorbed. Melt 15 parts of paraffin and 2 parts of balsam of Peru together and add the swollen chicle. Keep ready a mixture of 160 parts of granulated fine sugar and 64 parts of glucose boiled in 50 parts of water to the 8th degree of candy boiling *i.e.*, if a drop of the liquid be thrown over cold water, it should snap. Spread the syrup over a marble slab previously greased with butter, ghee or some other sweet oil, and carefully stir in a little at a time the melted mixture referred to above, until the whole has the proper toughness. The flavouring essence *e.g.*, essential oil of cinnamon, peppermint, clove, sandal-wood etc., should be added to the gum mixture.

N.B.—If desired, the addition of paraffin may be avoided. Great skill is necessary in the manipulation of the mixture ; this can, of course, come with practice. The sheets of gums thus obtained are cut in long pieces and then sub-divided by special machines in small bits with which the reader must be familiar.

(2) Chicle, 60 tolas ; sugar, 160 tolas ; glucose, 32 tolas ; water, 48 tolas ; balsam of Peru, 2 mashas. Some flavouring essence.

Sen-Sen a chewing gum is extensively used in America for keeping the breath sweet, cleaning the throat just as the Indians chew cardamom seeds or perfumed nuts. A preparation after Sen-Sen may be made by reducing 4 oz. of extract of liquorice (*sat mulethi* of the best type) ; $1\frac{1}{2}$ drams menthol ; 4 oz. cinnamon powder ; 4 drams, Balsam Peru ; $\frac{1}{2}$ oz. gum tragacanth. Reduce to a fine paste, letting it dry somewhat, when it can be rolled into thin cakes. Cut it into thin bits by means of a machine or roll into pilules.

Mouth Pastils to Sweeten Breath.—Excellent pastils for smokers and for persons having offensive smell can be made with the following formulæ:—

(1) Extract of liquorice, *sat mulethi*—(take of the best quality) 1 oz ; oil of cloves, $1\frac{1}{2}$ drams ; oil of cinnamon, 5 drops.

(2) Powdered coffee, $1\frac{1}{2}$ oz. ; finely powdered charcoal, 1 oz. ; vanilla, 1 oz. ; mucilage *i.e.*, thick paste of gum arabic, sufficient. Make into lozenges.

Tambul Bahar.—To make something like this proprietory article, so much used for adding to the aroma of betel-leaves, powder finely 2 oz. (feril root) ; 2 oz. betel-nut dust ; 4 oz. jastimadhu powder ; *bari elaichi*, 2 oz. ; *chhoti elaichi*, 3 oz. ; carraway powder, 1 oz. ; cinnamon bark, 1 oz. and triturate with the mass 5 drops of otto rose and 2 gr. of synthetic musk. Pack in small tin pots.

Rose Almonds.—Good blanched or unblanched almonds are placed at the bottm of a copper vessel, cleaned and heated, and, while one man stirs the almonds with a wooden spatula or by vigorously tilting the containing vessel another pours in syrup of white sugar boiled to the 'blow' degree and still hot. In this way, the sugar crystallises over the almonds. If desired a little non-poisonous pink colour and a few drops of rose otto may be added as the liquid sugar is being poured.

This process of coating sugar over almonds may be extended to a variety of other things, *e.g.*, sesame, cardamom seeds, aniseeds, cocoanut slices, poppy

seeds, caraway seeds, and even to groudnuts. The last one can offer great prospects of profit in any town.

Throat Pastils.—We have tried Formamint for sorethroat, but as far as our experience goes, it does not at all possess the therapeutic properties claimed for it. Tablets manufactured according to the following formula should prove to be a successful rival against all western nostrums.

Purified extract of liquorice, 16 tolas; water, sufficient; trangacanth, 2 tolas; sugar, 5 seers, and 10 chhataks; extract of poppies, 5 tolas; extract of long pepper *i.e.*, peepal (*filfal daraz*), 5 tolas; *beehdana*, (seeds of quince) 5 tolas. Dissolve the liquorice in 12 tolas of water: swell the tragacanth in 20 tolas and *beehdana* in 1 seer of water. Mix these three paste like things, removing of coarse the seeds of *beehdana*, and add other ingredients. Boil a little to the desired consistency and cut up into small pieces like *reories*.

Crystallised Fruits.—Sprinkle sugar thickly over tin boards over which spread a single layer of the fruit. Sprinkle over thickly with granulated sugar and place in the oven or the sun till it reaches the ball degree—*goli ki chasni*—stir with a wooden spoon or spatula until it crystallise and stick to the fruit. When cold, remove the superfluous sugar, and put out again to dry when it may be placed in layers between waxed sheets of paper in boxes and preserved in cool and dry place. The syrup may be made by boiling 1 seer of sugar in half as much water. If greater quantity of sugar is taken, less proportion of water will be required. Test the ball degree of sugar by dipping a little in cold water when rolled between the thumb and finger, it should form a ball. The fruit to be conserved should be first made to simmer for a little while in this syrup, when the water should be drained off and the fruits spread as above.

Lime Tablets.—Very refined sugar, 20 lb.; glucose, 51 lbs.; citric or tartaric acid (*Sat-Lemoon*), 5 oz. Put the sugar in a clean copper kettle, pour 5 pints of water, stir well, and set over a brisk fire. When the sugar is boiling cover it with a wooden lid so as to steam down all the grain which may adhere to the side of the pan; let boil for a while, lift off the lid, add the glucose, and cook to 350 deg. After the batch

is done, pour on the greased marble slab, fold in the edges, and seive the acid over the top of the sugar : then sprinkle over the lime juice or oil of lime, and add sufficient green vegetable colour, *i.e.*, chlorophyll, to give it a bright tint. Fold the batch together and work it with your hands to mix thoroughly the flavour, colour and acid, but do not handle more than necessary as the sugar should remain as clear as possible. Lay the mass near the batch warm, cut into small pieces and run them through the tablet rollers. After they are cold, sift off and put away in tin cans or glass jars. Other fruit tablets are made in the same manner, only changing, flavour and colour to suit the name.—*Hopkins.*

Peppermint Lozenges.—It is pity that for want of enterprise, India should have in times past imported so much of these tablets from beyond the seas when sugar and oil of peppermint required in the manufacture of these tablets were to be had so plentifully. For the preparation of these lozenges the sugar should be prepared as in the foregoing article and the desired quantity of oil of peppermint added at the time of spreading out the liquid sugar. Another way is to make a dough of powdered white sugar, 7 lb.; pure starch, 1 lb. and oil of peppermint according to the strength required. Mix with mucilage and get tablets made with a tablet-making machine.

Confectionary Drops.—Take desired amount of double refined sugar. Pound it and pass it through a hair sieve, not too fine. Then sift it through a guaze sieve, so that all the dust that is likely to mar the beauty of the drops may be removed. Put the sugar in an open iron kettle and moisten it with the desired aromatic substance like rose water, vanilla, *keora* etc. Pour the aroma slowly, stirring all the time with a wooden paddle or *mussed.* As soon as it is moist enough without any sugar sticking, colour it red with liquid carmine or with any soluble colour sold in the market. Place this paste in a pan with cover. Place the pan on a stone having a depression of the size and shape of the bottom of the pan, or in a cavity in the ground. Stir the paste with a bone or ivory handle until it becomes liquid. Heat it to almost boiling, take it off the fire and continue stirring with the paddle. If it be too much liquid, a

spoonful of the fine sugar may be added to the paste so as to bring to such a consistency as would not run too much extension. Take a very clean and smooth tin-plate. Take the plate carrying the paste in the left hand and in the right hand have a silver, or superior iron wire four inches long to take the drops as they fall from the lip of the pan. Let them fall regularly on the tin-plate. Let them alone for two hours, then they can be removed with the blade of a knife.

FRUIT CANNING.

When we realize the abundance of fruits in some parts of the country as compared with rarity or absence in other parts *e.g.*, Western Rajputana; of there being some peculiar fruits in one part of the country to the exclusion of all others; and of there being fruits of one type in one or other month in one part while the same fruit fructifies late in other parts; a vista opens up before our eyes as to the vast possibilities of fruit growing *e.g.*, the cultivation of apples and good grapes is mostly confined to the Northern Punjab; the orange season is practically over in the Punjab in February, but C. P. can export them till May; there are to all intents and purposes hardly any mangoes grown north of the Ravi and upward an elevation of 3000 ft.; the mango and melon season in the Punjab is very late; the *loqat* season in the Punjab is generally in the month of April, while in the Punjab hills they can be had only in the rainy season. The apple season is over in Chamba by September and in Kulu by October, but apples from Kashmir continue to be imported till end of December. All this variety offers limitless possibilities for enterprising people.

In canning fruits, tin vessels should be avoided for the acid present in them attacks the metal. Enamelled pots serve the purpose best. Boiling kettles should be broad but not deep. The fruits selected should be a little under-ripe. Imperfect fruits should be picked out. Fruits as they are brought to the factory should be stored in a cool dry place. The room should be scrupulously clean and free from dust. All the vessels used should be washed with the boiling water. It is a good plan to go on preserving fruit with sugar syrup as they are being pared. For this purpose two

sets of vessels and some assistants will be required. Where it takes some time, before the fruit is boiled, the pared fruit should be dropped in cold water with a little lemon juice. This will keep the fruit white. The fruits being pared should always be freed from dust by means of clean water. Peaches and apples are best pared with a silver knife or pearl shell ground on the convex side on a stone slab—iron knives always strain the fruit. The corks or stoppers of the jars should be in perfect condition. The fruits after they have been boiled should be packed tightly in the jar, the syrup of the desired consistency added so as to cover the fruits well, and the jars quickly sealed. All these precautions are necessary to protect the fruit from germ spores which set up fermentation. It must be remembered that sugar and honey like salt are great preservatives, but the syrup must be sterilized before being used. Strawberries, sour cherries or plums, and quinces are the best to preserve. In preserving, the use of large quantity of sugar should be avoided.

Pear Marmalade.—Peel, halve, and core some large pears, cover with water, and boil till tender. Take out the fruit, and add the peel and cores to the water. Boil till reduced to half the amount, and strain. To this syrup allow three-quarters of a pound of sugar and one pint of water to each pound of fruit. Boil up the syrup till it jellies on the spoon, put the pears in again, and boil, stirring for a few minutes till the preserve is quite smooth.

Tomato Marmalade—Tomatoes are rich in vitamin. They have a specific action on liver and ought to form part of our menu.

To prepare tomato marmalade, take ripe tomatoes, 7 lbs. loaf sugar, 8 lbs.; lemons, 6; water, 1 pt. Blanch and skin the tomatoes and cut them in halves. Remove the rinds and all the white pith of the lemons, and slice the fruit thinly. Boil the sugar and water to a thin syrup, add the prepared-tomatoes and lemons and bring to boil. Stir and skin frequently and continue to boil gently until the marmalade quickly jellies when tested on a cold plate. Pour into pots or glasses and store in a cool dry place. Requires about ¼ hour.

Orange Marmalade.—Take the rind of freshly

peeled 12 oranges and 2 lemons. To each lot of the rind add 3 pints of cold water in an earthenware or stone jar. Cover it for three days. Then boil it in a kettle until quite soft and tender. Let it cool, and add equal weight of sugar to the fruit so prepared. Bring to boiling point. Take off the scum. Cook slowly until the syrup stiffens when tested on a cold plate. Pour into jars or pots, and cover with paper brushed over on both sides with white of egg. Let the pots be deposited in a cool dry place. In four days the marmalade will be ready for use. *A very suitable industry for C. P. and Panjab.*

Pineapple Marmalade.—For each pound of pine-apple pulp take 4 oz. of loaf-sugar. Boil the mixture until thick and clear. Transfer into pots. Cover first with paper on both sides of which egg whiting had been rubbed ; and then with prachment paper. It will be ready for use in three or four hours.

The pine-apples taken should be peeled and sliced or preferably grated A good industry for Bengal.

JAMS.

Apples.—Remove skin and pips as in mangoes below. Cut thick slices. Place slices in alum water as they are being cut. Drain. Preserve as mangoes. *Nourishing.*

Figs.—Make slits across the tops of green figs and steep them in brine (that will float an egg) for 8 days. Take off all water. Boil in a little water gently till quite soft, when drain and steep in cold water. Change water for 3 days, when prepare syrup with sugar equal in weight to the quantity of green figs taken. Boil the figs in the syrup for about 10 minutes. Repeat this three days, till the figs are tender. Preserve as grapes. *Laxative.*

Pear Ginger.—Peel and cut up four pounds of pears, and boil in half a pint of water till transparent. Take them out, add four pounds of sugar to the water, and boil ten minutes. Cut up one pound of preserved quinces, add one dessertspoonful of ground ginger, and add the pears. Boil slowly for twenty minutes.

Ginger.—Put the green ginger in fresh boiling water every morning and evening for a fortnight.

Remove the skin, boil till quite soft, and cut in thin slices. Preserve in syrup made with equal quantity of water and sugar. Carminative, but a little bit constipating.

Gooseberries, Preservation of.—(*Karaundas*). Take sound and unripe green gooseberries. Put them in wide-mouthed bottles or jars round which wrap hay or straw. Spread hay or straw in a large boiling vessel. Place bottles over this hay and fill water round them up to one-third of their length. Put water in the bottles also. Slowly bring the water to boil and then let cool slowly, until the gooseberries rise to the top, when to each bottle add a little boiling water. Cork afresh, seal, and store in a cool dry place. Sugar or syrup should be added when required.

Gooseberry Jam.—Cut, and pick out the seeds of fine, full grown goose-berries, but not ripe. Put them into a pan of water, green and put then into a sieve to drain. Beat them in a marble mortar, with their weight in sugar. Boil a quart of them to a mash in quart of water ; squeeze and to every pint of liquor put a pound of fine loaf sugar. Then boil and skim it, put in your green goose-berries and having boiled them till very thick, clear, and of a nice green colour, put them into glasses.

Grape Jam.—Select only firm, sound, and unripe, grapes. Have as much sugar by weight. Place the fruit and sugar in alternate layers in a preserving pan. Stand by the side of fire till thoroughly hot and a part of the juice is extracted. Bring slowly to boiling point till the juice quickly set on a cold testing plate. Pour in cold pots and seal. A likely and profitable industry for Quetta and Peshawar. Can command great sale in Bengal.

A cheap substitute for grape jam may be made by removing pips of gooseberry, *i.e.*, *karaunda* and preserving as above. Suitable for the United Provinces (See above.)

Lemon.—Same as oranges, but add twice as much sugar. *Antiscorbutic*. Excellent for trade in seaports.

Mango.—Take large green mangoes. Place them in cold water for about six hours. Remove green skin with a pearl-shell ; also stones. Let the big slices as they are being cut be placed in weak lime-water for

1 hour. Drain well and place in cold water. Boil for 10 minutes. Again drain well. Place in syrup and boil to crystallisation. Transfer to jars. Examine the syrup frequently during the following month and if the syrup be thin, boil it again.

Myrobolans. (*amlas*).—also *Harars* (1) These should be steeped in water for 24 hours, pricked well with lucille, placed in lime water, boiled and drained, and then again boiled with preserving syrup. Best *Harars* are placed in honey, while cheap jam is made with molasses.

(2) Wash the fruit in clean water. Soak in cold water overnight. Large size fruit should be pricked. Boil well in water for sometime. When soft, remove the boiling keettle from fire. Drain. Boil in medium syrup. Preserve or can. This fruit is an excellent tonic and if taken with or without silver leaves has a specific action on the heart. It is excellent for weak people. The syrup in which the fruit is preserved acquires greenish colour which changes into violet on addition of water, an excellent summer beverage.

N.B.—Since the discovery of vitamins it has been found that preserved or artificially ripened fruits, as well as jams and preserves, lose a good deal of vitamins. Hence the importance of taking fresh fruit ripened in the natural way. These cannot be had, however, at all places, and in spite of this discovery trade in jams and preserves as well as in the artificially ripened fruits will continue unabated for a long time to come. In war time, the necessity of falling back upon canned food becomes paramount.

Use of amlas is greatly praised in Ayurvedic system of medicine. Its continuous use makes for longevity. It is claimed in a treatise on Unani system of medicine that by taking jam of one harar daily at bedtime with milk for 40 days on end one's eyesight is greatly improved. With iron salts like Ferrous Carb sagrada, *amla* or its preserving syrup will prove an excellent remedy for anæmia, jaundice and dyspepsia.

Oranges.—These should be taken green. Remove rind and white pith. Slice thinly. Weigh and take thrice as much water. Let stand for 3 days. Boil gently until quite tender. Let cool. Add as much

sugar as the weight of the fruit. Now boil syrup to the setting point. Bottle, seal and preserve in cool, dry place. *Very good for liver and so for general health.*

Petha.—Remove rind and seeds. Place slices in strong lime water for about a day. Drain well and boil in fresh water. Drain. Let cool. In the meanwhile boil syrup and place the slices in the syrup. *Excellnet for heart.*

Pears.—Same as apples.

Pine-apples.—Remove skin and slice. Place in a large dish in layers, placing plenty of loaf sugar between. Keep in a cool oven for 7 or 8 days, turning the slices frequently. When quite dry, bake a few slices at a time in an oven with moderate heat. On their being quite cool, pack in air-tight boxes with paper between layers.

Plums.—Remove stones. Put in layers in a large dish, with plenty of sugar between each layer. Let stand for a day. Put in a preserving pan and heat by the side of fire all the while stirring it. Boil slowly until the jam at once set on being tested on a cold plate. Store in cool, dry place. An excellent industry for Rohtak and Aligarh Districts.

Sandalwood Jam.—(*Artificial.*) This is not really made from sandal wood for then it should be very bitter. Green pumpkin or *petha* which is used for making sweets or *halwa* is peeled and cut into the form of sandalwood blocks. They are punched with a lucille or a fork soaked in lime water for 24 hours and boiled to soften hardness. When they are thoroughly cool and dry from outside, cool thick syrup previously prepared for the purpose is poured and flavoured with a few drops of sandalwood oil.

PRESERVATION OF FRUITS.

Fruits, Preservation of.—1 Get 6 qt. of grape-juice. Boil it to 4 qt. Wash and pare the fruit; if apples or pears, have them quartered and cored. Put the fruit in a preservation pan or kettle. Cover copiously with the grape juice. Boil gently to make the fruit clear and tender. Store in sterilized jars. Cover immediately. (2) Prepare the fruit as above and preserve in honey (3) Take boric acid one lb., water 45 lbs.

Stir well to dissolve thoroughly. Add five pt. of alcohol. Should the solution be not clear, let it by to do so. When it is so, drain off the upper portion, and filter the remaining lot. Dip the fruit like potatoes, onions, eggs, raspberries, red or black, currants black, cherries red or black, gooseberries, plums dark coloured, grapes red or black. Let a small layer of the liquid float on the fruit. Experiments carried on by process No. 3 have been tried on long voyages in the Tropics from Freemantle to Singapur and back again with marvellous success, the fruit having kept itself fresh during the double journey.

PICKLES.

Cabbage.—Remove the outer leaves, and chop finally the heart. Spread on a large shallow dish, sprinkled freely with salt, let stand in a cool place for 23 hours, drain away all the liquor, place in cold jars and pour over vinegar with spices described under onions below. Cover securely.

Cualiflower.—Salt the pieces of white cauliflowers and let stand for six hours. For every seer of cauliflower, take one tablespoonful of pepper, 1 teaspoonful of powder cinnamon, nutmeg, and cloves. Tie in a muslin bag and boil in vinegar for half an hour. Let cool perfectly. Remove superfluous salt from cauliflower, and place in unglazed earthenware. Cover with prepared vinegar. Store in a cool dry place. Can be used in about a month.

Chow-chow.—Take 4 seers of green tomatoes, one large cabbage, and seven big onions. Cut into small pieces; mix well with salt; stand overnight with 1 oz. of celery seeds, (*pitarseli*), 4 oz. of white mustard seeds, 1 oz. of ground pepper, 1 oz. of cinnamon. Boil 24 oz. of vinegar, and 1 seer of brown sugar, and when boiling hot, pour over the previous lot.

Cucumbers.—Salt ½ in. slices of cucumbers just like cauliflower above when place on hair-sieve to drain for 2 hours. Place in wide-mouthed bottles and cover with vinegar prepared thus: 1 seer of vinegar; 5 tolas of pepper; 5 tolas of allspice or nutmeg, cloves or cinnamon; 1 teaspoonful of salt. Boil and pour over cucumbers while hot. Cover tightly. Store in cool, dry place. If vinegar be covered over with mold it should be reboiled. Unfit for export.

Lemons.—Tear three or four slits in each lemon and preserve in vinegar prepared as follows: Lahori salt, 1 seer, mustard seed, tied in a muslin bag, 1 *powa;* peeled garlic, 2 chhataks; powdered nutmeg, 5 tolas; ground mace, 5 tolas; ground cloves, 2 tolas; grape vinegar, 1 seer.

Lime.—(*galgal, kimb*). Limes, 25; salt, 9 t.; green chillies, 9 t.; green ginger, 9 t; husked mustard seeds, 5 t.; turmeric powder, $2\frac{1}{2}$ t. ; good vinegar, 12 chhataks. Cut limes across in halves; press out all juice to be stored separately; mix 2 oz. of salt and cover closely. The remaining salt should be sprinkled over the rinds which after 6 hours should be put in the sun for about 3 days to get dry and hard. Boil in the vinegar the spices for about 20 minutes, mix with lime juice, strain over lime, place rinds compactly in jars, cover closely, and place in the sun for about four days.

Madar (*ak leaves*).—Place the leaves in a heap of lime till all their bitterness is gone. Preserve in salted vinegar. Storage of green leaves in a heap of wheat will give equally good results.

Melons.—Take small green melons, small French-beans *Frashbeen,* grated (*ghiakas*) horseradish, cloves, powdered nutmeg, cinnamon, pepper, vinegar. To each seer, add 1 teaspoonful of allspice, cloves, and black pepper. Scoop out one end and replace the covers, and tie round with *kaccha* threads. Steep for four days in strong salt water. Drain and dry well. Sprinkle the hollows of melons freely with spices, and stuff with beans, raddish etc. Tie the ends as before and replace the melons with their cut ends uppermost. Boil the vinegar and the remaining spices for 10 minutes and when cold pour over the melons. On the following day, take out vinegar, reboil, and pour boiling liquor over the melons. When cold, cover as air tight, and keep in a cool, dry place.

Mixed.—Prepare vinegar as follows; good vinegar, 5 bottles; bruised ginger, mustard, salt, 4 oz. each; turmeric powder, $1\frac{1}{2}$ oz.; black pepper powder, 1 oz.; chillies, $\frac{1}{4}$ oz. Make a smooth paste of mustard, turmeric, pepper and chillies, till no lump remain, with remaining vinegar. Add remaining ingredients. Mix well. Keep in a warm place for a month, stirring

well every morning with a wooden spatula. At the end of this period, the different vegetables, being freed from outside moisture, and cut, should be pickled in jars and the mouth secured tightly with bladders or parchment paper. Ready in 3 months. Keep in a cool, dry place.

Mushrooms.—Mashrooms (*Khumbs*), 1 seer ; vinegar, 1 seer ; bruised ginger, 3 tolas ; white pepper, 1 t. ; mace, ½ masha ; salt, a little. Free the mushrooms from dirt, peel, and cut off the tops of the stalks. Sprinkle with salt, place in a stewpan, agitate on the fire until the liquid flows. Heat on till a major portion of the mixture has been evaporated. Add vinegar and spices, boil, and slowly simmer for 10 minutes. Place in jars, cover well, and keep in a cool dry place.

Mushrooms are a delicacy in the Punjab towns. The trade of mushroom pickle can be carried on sucessfully where mushrooms are cultivated artificially.

Onions.—Peel and steep in salt water for two or three days. Strain and bottle. Boil vinegar with ginger, pepper, and allspice. When a little cooled, pour over onions. Ready in about a fortnight.

Tomatoes.—Prepare vinegar as directed under onions, and to each seer, add 1 desertspoonful of sugar. Put the tomatoes in a jar loosely, steep in boiling vinegar. Tie well to exclude air and steam. Should be used within a few days.

Walnuts.—Free fresh but unripe walnuts from shells ; steep in strong salt water for a week, drain well, dry. Pack in jars and cover with vinegar described under onions.

CHUTNEYS

Chutneys should be sold in wide-mouthed bottles with nice and attractive labels.

Indian Chutney.—Malt vinegar, ¼ gallon ; sour apples peeled, cored and sliced 1 lb. ; onions peeled and coarsely chopped, ½ lb. ; moist sugar, 1 lb.; raisins, stoned and quartered, ½ lb. ; salt, 4 oz. ; ground ginger, 4 oz. ; dry mustard, 2 oz. ; cayenne, ½ oz. ; 4 cloves of garlic finely chopped. Cook the apples, onions, garlic with the salt, sugar and vinegar until quite soft, and

pass them through a fine hair sieve. Add the raisins, ginger, cayenne, and mustard, mix well together, turn into a jar, and stand it in a warm, but not hot place, until the following day. Have ready some perfectly dry, wide-necked small sterilised bottles or jars; fill them with chutney, and cover closely so as to exclude air. This chutney may be kept for a year or two. Bottles or jams can be sterilised by rinsing with boiling water and then exposing to the sun.

Mango Chutney.—Take 50 fat green mangoes; 3 seers of vinegar; sugar, 1½ seers; stoned tamarinds, 1 seer; raisins freed from pips, ½ seer; sliced green ginger, ½ seer; cinnamon powder, 3 mashas; salt, ½ seer, Remove the rind of mangoes by means of a pearl shell, slice thinly, sprinkle with salt, let stand for 36 hours, and drain well. Boil sugar in half of the vinegar. Boil up the mangoes in the remaining vinegar, let simmer for 10 minutes. Add the remaining ingredients and cook for 20 minutes, add syrup gradually and cook for another 20 minutes. The whole cooking will take about 1½ hours. When the syrup is absorbed for the most part, bottle, cork securely and store in a dry place. This trade can be best carried on in all parts of India excepting Rajputana, N. W. F. P., and W. and N; Panjab. Best industry for Bengal.

English Chutney.—This chutney is made as above, with the following ingredients: sour apples, 72; brown sugar, 3 seers; salt, ½ seer; raisins, 2 seers; green ginger, ½ seer; chillies, 5 chhatanks; mustard powder, 2 chhatanks; good onions, 10; shallots, 12; good malt vinegar, 6 seers.

Tomato Chutney.—Take ripe tomatoes, 12 seers; vinegar, 3 seers; chillies, 2 chhatanks; sugar, 4 seers; pulped raisins, 6 seers; sliced apples, 2 seers; ripe bananas, peeled and sliced, 1 seer; ginger powder, 1 powa; black pepper powder, 5 tolas; bruised shallots, 8; salt, ½ seer. Let the tomatoes and raisins be boiled for 5 mts. and strained in a bung jar, to which should be added the remaining ingredients. Tie securely and boil in an enamelled pan over a water bath for an hour. Let cool and bottle. Ready in 3 months.

Bengal Chutney.—Take tamarind pulp, tomato pulp, raisins, minced apples, 1 powa each; grated rind

and half the juice of 6 lemons ; peeled garlics, 5 tolas ; 3 chopped onions ; ginger powder, 1 powa ; chillies, 10 tolas ; moist sugar, 1 powa ; strong vinegar, 2 seers. Mix thoroughly, let stand in a warm place or in the sun for a month to ferment. Stir occasionally. Then bottle. Keep in a dry place.

SAUCES.

Worcestershire.—Take good vinegar, 1 seer, The following in powders ; pimento (Jamaica pepper), 2 drams. ; cloves, 1 dr. ; black pepper, 1 dr. ; mustard, 10 tolas ; tamarind pulp, 4 oz. ; sherry wine, 1 pt. ; curry powder, 1 oz. ; chillies, 1 dr. Mix well, simmer for an hour and strain. Let stand a week. Strain again and bottle.

Tomato Sauce.—Cut tomatoes in halves and place them three days in the sun, bringing them in at sunset. Give them a shake when putting them out in the morning. Make the sauce *Proceed thus* :—Warm a dessert-spoon of sweet oil, brown well in this a minced onion. When the onion is brown and crisp remove and throw it away. Pour the sauce with the oil, stir and simmer it on a slow fire till it becomes as thick as table sauce. (see next) Bottle when cool and cork well.

(One dessert-spoon of oil and one onion would do for a tea-cup of sauce.)

Table Sauce.—Brown sugar, 16 parts ; tamarind pulp, 16 parts ; good onions, peeled and chopped, 4 parts ; ginger powder, 4 parts ; salt, 4 parts ; garlic, 2 parts ; chillies, 2 parts. Boil with water to the desired consistancy.

Soy (Japan Sauce) Soya beans, 2 parts ; ripe apples, 64 parts ; mustard powder, 2 parts ; curry powder, 1 part. Peel the apples ; core ; boil in sufficient vinegar with the tamarind and with a powa of raisins, until soft. Pulp through a sieve. Add garlic and onions in the form of pulp, and then the remaining ingredients, and lastly 60 parts of vinegar. Boil, cool, and add sherry wine 10 parts, and enough vinegar. For sweetness treacle should be added before boiling.

Soya is imported from China and Japan and is now available in India from respectable drug stores, and

oilman's stores. Imitation soya may be made as follows; Boil peas or beans, 1 part, till soft; mix equal quantity of bruised wheat. Store in a warm place for a full day, when 1 part of salt, and 2 parts of water should be added. Place in a stone or glazed jar, bung it up for about 3 months, shaking it very often. Finally press out the liquor.

Anchovy Sauce.—Chop 3 or 4 anchovies fine; mix 3 oz. of butter and 2 oz. of water; 1 oz. of vinegar and 1 oz. of wheat flour. The butter should be melted over a water bath, then water and vinegar added and lastly the flour and the fish. Stir until the mixture grows thick; rub through a wire sieve. Must be used readily.

MISCELLANEOUS FOOD PREPARATIONS.

Curry Powder.—Coriander, 3 parts; turmeric, 8 pts.; pepper, mustard, ginger, each, 1 part; allspice, ½ part; cardamom, ½ part; cummin seed, ¼ part. Make fine powder and bottle.

Indian Curry Powder.—Coriander, 360 grains; turmeric, 100 gr.; fresh ginger, 250 gr.; cummin seed, 18 gr.; pepper 54 gr.; poppy seed, 94 gr.; cinnamon, 20 gr.; cardamon, 40 gr.; cloves, 20 gr.; grated cocoanuts, ½, Ground all excepting cocoanuts which should be grated finally. Mix.

Baking Powder.—Salt, 320 parts; bicarbonate of soda, 240 parts; pure cream of tartar, 220 parts; white sugar, 120 parts; corn starch, 100 parts.

Quick Baking Powder.—Cream of tartar, 64 parts; sodium bicarbonate, 2 parts; ammonium carbonate, 1 oz.; rice flour, 32 parts.

Berlin Yeast Flour (Baking Powder)—Carbonate of ammonia, 2 parts; powdered starch, 16 parts; bicarbonate of soda, 16 parts; tartaric acid, 15 parts.

Malted Food for Infants.—(1) Powdered malt, 1 oz.; finest ground oatmeal, 2 oz.; sugar of milk, 4 oz.; baked flour, 1 lb. Mix thoroughly. (2) Baked wheat flour, 10 oz.; ground malt, 2 oz.; sugar of milk, 4 oz. There is no necessity of adding phosphates. A more palatable food can be prepared by adding desiccated milk, but this, of course, is not essential as fresh milk is always added before use. Dry all the ingredients before mixing by spreading on large flat clay dishes in

a moderately cool oven. (3) This powder is to be added into the milk; and the liquid evaporated and powdered if a dry product is desired. Powdered malt, 1 oz.; powdered oatmeal, 2 oz.; sugar of milk, 4 oz.; roasted flour, 1 lb. Babies reared up on malted food will thrive well.

Malted Food.—(*Horlic Type*), baked first class white flour, 16; powdered malt, 1; sugar of milk, 4; finest oatmeal or arrowroot, 1; phosphate, cocoa powder, lecithin, if desired, ¼.

For the Manufacture of Malt, See Chapter II.

Chocolate Caramels.—Grated chocolates, 1; brown sugar, 1; molasses, 1; sweet milk, ½; Boil until a drop of the mixture put into cold water hardens at once. Just then add cold butter of the size of an egg and part of chopped walnuts. Pour out the mass in a buttered dish. When cold, cut into bars. All other caramels are made in the same way, the difference being in the flavour only. Pack in oblong fancy cartons.

Dry Ginger.—According to Baden Powel in his '*Punjab Products*', the *sonth* is suspended by a rope, and shaken for 2 honrs daily for 3 days. The pieces are then dried in the sun for 8 days, and again shaken in the basket. This removes the outer skin and the scales. 'Two days' further drying completes the process. In Malabar, the ginger, before it is dried, is peeled and then bleached and cured, washed in lime water and once more dried, then placed in baskets in upper parts of the kiln and fumigated with sulphur smoke for 2 hours. The washing and drying process is repeated thrice.

N.B.—Ginger is imported from the hills so that early in winter when it sells cheap, dry ginger (*sonth*) can be prepared at the foot of such hills. *e.g.*, in places like Pathankot, Kasauli, Dehradun, to reduce the freight.

Digestive Biscuits.—Fine oatmeal, sugar, wheat flour, 2 lb. each; eggs, 1 part by weight; margarine or ghee 1½ part; milk sufficient quantity. Mix flours together, rub in the ghee thoroughly. Make a hollow in the heap of flour, put in sugar and pour in the contents of the eggs, and a little milk. Make a nice dough. Roll out thinly, cut in suitable pieces, place on tinplates, wash over with a little milk, and bake in an oven with

moderate heat or within two hollow plates of iron heated from above and below by means of live coal. Very good for dypspetics and invalids.

Gingersnaps for Children.—Take one cupful of thick treacle; 1 cupful, fresh butter; 1 teaspoonful of ginger powder; ½ dr. cinnamon powder; salt, 15 gr.; baking soda, 45 gr.; flour enough. Mix up the butter and treacle, add soda, and beat up foam, stir in salt and spices and then the fine flour. Make 1 in. thick cakes and place on the baking board. Sprinkle a little of grated cocoanut, and bake in an oven quickly.

Ginger Biscuits.—3 oz. of butter: 2 lb. of flour; 3 oz. of sugar, and 2 of ginger. Knead into a stiff dough with fresh milk. But bake in a slow oven until of pale colour and crisp.

Very Nice Biscuits.—2 lb. of wheat flour, 3 dr. of carbonate of ammonia powder; 4 oz. of white sugar; 1 oz. arrowroot; 4 oz. of butter: 1 egg. Bake as above.

Water Biscuits.—(1) One pound of flour and a little salt. Mix into a nice dough with about three-quarters of a pint of thin cream, heat well, roll out very thin. Cut in large pieces and bake in a hot oven. Keep turning or they will soon burn.

(2) One pound of flour, one teaspoonful of salt, one ounce of butter dissolved in about half a pint of warm milk. Mix into a rather stiff paste and heat it well with rolling-pin. Then roll out very thin, stamp out the biscuits and bake in a hot oven for a few minutes.

Cheap Cake.—Take flour 5 lb.; sugar and butter, 1½ lb. each; raisins, ½ lb.; orange peel, ½ lb.; caraway seeds, 4 oz.; ginger or cinnamon powder, 1 oz.; carbonate of soda, 6 dr. Mix well within a little more than 1 pint of fresh milk. The butter should be melted beforehand. Bake in a slow oven for 10 to 15 minutes.

Scotch Pan Cakes.—For scotch pan cakes mix thoroughly six tablespoonfuls of flour, half a teaspoonful of cream of tartar, two teaspoonfuls of sugar, and a quarter of a teaspoonful of baking soda. Add a beaten egg and enough milk to make a butter; not too thin. Have a hot frying pan ready, rubbed over with dripping, then put in the butter in spoonfuls. The pan should be hot enough to set them as soon as they are put in it.

Fruit Elixer.—Any fruit jam, 2 lb.; 45 per cent.

alcohol, 2 pints. Mix and macerate for a day or two. Strain, press and filter.

Limepepsin.—Pure pepsin, 260 gr.; distilled water, 3 oz.; glycerine 3 oz.; alcohol, $1\frac{1}{2}$ oz.; refined talcum, $\frac{1}{2}$ oz.; lime juice, enough to make 1 pint. Mix pepsin in 8 oz. of lime juice. Dissolve in water, add glycerine and alcohol, and finally the remainder of lime juice. Mix well talcum and let stand for a few minutes stirring it occasionally. Filter. Will make 3 seers of syrup. Very good for promoting digestion.

Egg Powder.—Rice flour, 24 parts; sodium bicarbonate, 16 parts; tartaric acid, 4 parts; cream of tartar, 8 parts; azo-orange dye or for home use saffron or turmeric in dilute spirit, sufficient.

Butter from Groundnuts.—During the First Great War the prices of ghee soared high and gave a great chance to the fraudulent merchants to adulterate the genuine article with all sorts of inferior stuff, including refined petroleum products *e.g.* the odourless white oil. Large quantities were consumed by the unwary people, and it was not until questions were raised in the Imperial Legislative Council that the matter was known to general public. Now that the prices of ghee like those of so many other commodities have once more gone high ghee is extensively adulterated as before; in large towns it is no easy matter to get pure ghee. Where such be the case, enterprising people will do well to sell groundnut butter. Peanuts contain 35 per cent oil. The process of extraction is described in Chapter II. The residue is white farina and is very valuable for its nutritious properties. It stands second to lentils. In America, butter from groundnuts commands large sale and is favourite with the masses. As a result of the efforts of Mr. J. Lambert of Marshall, Michigan, three machines were invented and sold direct to a consumer with a bag of shelled peanuts with instructions to manufacture butter at home. One of the machines was meant for roasting, another for clearing, and the third one for grinding the nuts. Thus 2,000 pounds of groundnut butter began to be manufactured daily. The cost of the set of machines during the First Great War time was quoted at 600 dollars. A 5 H.P. electric motor can drive the set. Smaller outfits are also supplied.

Test on a small scale may be made in any household. Just dry by heat a quantity of shelled nuts so as to loosen the skin, taking care not to heat too much to burn the oil contained in them. Place the scorched nuts in a kerchief and rub the nuts. Separate the skin by winnowing. Reduce them to a paste in a mortar. This in itself can be used as well as butter.

ICE CREAMS.

Ice Creams.—For the most part of the year, North India is hot enough to command a good sale of ice-creams. The cheap ice-creams sold in the market by the hawkers are generally very third class stuff, and cater to the masses only. Often they are made in unhygienic conditions. If educated youngmen could throw off their false sense of shame, and go about the houses of big people in big towns, they can make a decent living by retailing the following ice-creams:

General.—Pure cream, 2 gallons; sugar, 2 lb.; flavouring and colour to suit the taste. Mix well and freeze.

Corn Starch Cream.—Dissolve $\frac{3}{4}$ lb. of corn starch in 1 quart of milk with heat; mix 2 lb. of sugar. Add 9 lb. of milk more, and continue heating till the desired consistency is obtained. Let cool. Add flavour and colouring. Freeze.

Almond Cream.—Cream, 2 lb.; blanched almonds, $\frac{1}{2}$ lbs.; orange-flower water, 2 oz. With the help of orange-flower water, grind the almonds to a fine paste. Pass through a sieve and grind the remaining lot. Again mix with the cream, and with the yolk of 7 eggs, make into a custard. Strain when cold, freeze. Eggs may be avoided by those who do not like them. Fine slices of pistachio may be added to any one of the creams. Almond cream is a brain tonic.

Banana Cream.—Cook the bananas in a small quantity of milk with sugar. Pass through a sieve. Add yolk of eggs as above. Add cream and milk in equal quantities and freeze. Add flavour and colouring.

Chocolate Cream.—Rub up well in a mortar 20 oz. of powdered chocolates; 1 pound of sugar; 1 oz. of cinnamon. Add 2 pints of cold water and 1 oz of best vanilla extract. Add this paste to 2 gallons of

khoya or *rabari*, removing all the lumps. Now add 3 gallons of boiled and cool unskimmed milk. Flavour and colour. Freeze.

Fruit Ice Cream.—Milk, about 18 oz.; sugar, 2 cupfuls: corn flour, 1 small tablespoonful; eggs, 2; gelatine, 2 tablespoonfuls soaked in a little water; cream, 2 pints; peeled and sliced bananas 4; candied cherries, ½ lb.; fruit if liked. Boil the milk rub in flour, sugar and eggs. Cool 20 mts. Add gelatine. When cold, add cream. Freeze for 10 minutes. Add the fruit, and finish freezing.

Grape Ice Cream.—Sweet cream, 2 pints; sugar, 12 oz.; grape juice, 1 pint. Boil one-half of the cream. Stir in and dissolve sugar. When cool, add cool grape juice and the remaining cream, and freeze.

Lemon Ice Cream.—To make 40 pints, grate the rinds of 12 whole lemons on 1 lb. of sugar. Do not grate deeply or your cream will be bitter. Triturate. Add 20 pints of cream and 5 lb. of sugar. Strain into the ice-cans. Watch closely to prevent buttering.

Orange Cream.—Eight Nagpur oranges (the mid-winter fruit of Punjab may be substituted); good size lemons, 2; cream, 2 pints; sugar 12 oz. Grate the rind of 4 or five oranges and 1 lemon on sugar. Squeeze and strain the juice of all. Mix well. Add the cream. Mix and freeze.

Pistachio Cream.—Cream 2 pints; pistachios sliced, 8 oz.; sugar, 12 oz. Mix. Flavour with rind of lemon or orange grated on sugar or by boiling in milk a little cinnamon and mace. Colour green.

Strawberry Cream.—Crushed strawberries, ½ gal.; concentrated strawberry syrup, 1½ pints; pure cream, 10 gal.; sugar, 5 lb. For colour use red colour used for aerated waters or saffron.

CHEAP GRADE WATER ICES.

Apple Water Ice.—Apple juice 1 pint; simple syrup, ½ pint; juice of one lemon. Freeze.

Lemon Water Ice.—Juice of 5 good lemons; water, 4 pints; sugar, 2 lb. Freeze.

Orange Water Ice.—Orange juice, 1 pint; juice of 1 lemon; tincture of orange peel, 1 fl. dr.; simple syrup, 2 pts.; water, 4 pts. Freeze.

Mixed Fruit Water Ice.—Cut $\frac{3}{4}$ lb. of fresh fruits in season into small pieces. Mix with 1 pint of water, 1 pint of simple syrup and the juice of 2 lemons, and $\frac{1}{4}$ pint of orange juice, Add 1 fl. dr. of essence of vanilla. Freeze.

Freezing Mixture for Ice Cream.—Mix together 2 parts of nitric acid and 3 parts of sodium sulphate—a bye-product of nitric or hydrochloric acid. Place a can of cold water in this. The water will be frozen. With every 2 pounds of this ice mix one pound of common salt and let it surround the can containing milk and sugar or any other desired composition for ice cream and it will turn into ice cream. This is an excellent device for places where bazar ice cannot be had easily.

Freezing Mixtures.—To obtain a reduction of temperature of 5° on Fahrenheit scale, use salt, 1; pounded ice, 2; (*b*) *For* 25°, snow or pounded ice, 12; salt, 5; ammonium nitrate, 5. (*c*) *For* 33°; snow, 1; crystals of calcium chloride, 3. (*d*) *For* 40°, ammonium chloride, 5; seltpetre, 5; water, 16. (*e*) *For* 55°, snow, 3; dilute sulphuric acid, 2. (*f*) *For* 59°, snow, 8; muriatic acid, 5, (*g*) *For* 66° snow, 1; calcium chloride crystals, 2. (*h*) *For* 90°, Glauber's salt, 6, ammonium nitrate, 5; dilute nitric acid, 4.

GHEE SUBSTITUTES.

Imitation Olive Oil.—Pure olive oil, 20 parts; clear rapeseed oil, 10 parts; sweet cotton oil, 10 parts. Heat a little the rapeseed oil and mix cotton oil, and the olive oil. If necessary, strain.

Cotton Seed Oil is an excellent substitute for ghee and the vegetarians who regard even milk and ghee as animal food ought to take to the cotton seed oil. This can be purified by heating with caustic soda lye with constant stirring, and then decanting but it is much better to avoid the soda as it kills the natural vitamins. Artificial vitamins are no good.

Factitious Olive Oil.—Take (1) corn or maize oil, 10 parts: (2) distilled water, 8 parts; (3) sulphur; (4) olive oil, 2 parts; (5) arachis oil, 2 parts, (6) strong sulphuric acid (common salt as neutralizer) 1 part; orange oil to flavour. Put (4) and (5) into a big pan. Float in a cold ice water, and by degrees add (6) agitating

with glass rod. Mix some water also and then let stand. Then add strong solution of salt in water until the acid is neutralized—test by means of litmus paper. Let settle and drain off the clear oil on the top ; mix distilled water and (1), colour with the orange oil. Filter through Fuller's earth. A very cheap and good oil, quite pure and edible. In place of olive oil, the C. P. type of sweet (gingley) oil may be used.

Margarine.—For the manufacture of margarine, so largely employed in England and elsewhere, as a substitute for butter and ghee, the milk employed should be quite fresh and pure and sterilised. The fatty ingredients should be melted in double jacketed melting pans and then run into the liquid oils and mixed thoroughly. The melting being over, colouring matter should be added and the mixture stirred well. The mass (1) should be then cooled to the temperature required in subsequent emulsification. The cooled sterilised milk is then inoculated with lactic acid bacteria and allowed to ripen (2). The lactic acid bacteria may be ordered through some respectable chemists. Instead of lactic acid bacteria, fresh sour whey separated on keeping curd should be tried. The (1) and (2) should be then mechanically mixed as well as possible and then emulsified in a margarine churn. The churning vessel is surrounded by a jacket vessel into which hot or cold water can be introduced to regulate the temperature. The oil should be poured over the milk and not the opposite. After emulsification, the temperature should be lowered to 30° C.

Recipe : Oleomargarine, 65 parts ; vegetable oils 20 parts ; milk, 30 parts ; final yield, 100 parts. For vegetable oils, use cotton seed, sesame, arachis, olive, soya bean, or groundnut oil.

See also Butter from Groundnuts.

Book: Margarine by William Clayton, *Machine*. Correspond with : N. V. Grasso's Machine Fabriken. S., Hertogenbosoh, Holland.

ELECTRIC BULBS TO STAIN.

1. Clean the bulbs thoroughly and dry, Coat with the white of egg and again dry. Now dissolve any aniline colour in amyl acetate or photographer's collo-

dion and apply with a painter's brush. The paint will adhere firmly to glass.

2. *For temporary purposes*, any aniline colour or cochineal for red, turmeric for yellow, and indigo for blue colour may be mixed with saturated solution of alum and the bulbs dipped into it. Let the solution dry on it.

Razor Strop Paste.—(1) Dissolve fine emery powder in water. Let coarser particles precipitate. Decant the upper layer containing suspended emery and put on one side. Decant the water as the whole thing has subsided and dry the deposit. Make into a stiff paste with equal parts of suet and lard. To each oz. add 1 drop of oil of cloves. Pack in small tins.

(2) Grease the strop with a little olive oil or sweet oil. Rub over it evenly fine grade emery powder. (3) Triturate fine grade emery with wax until proper paste made. Rub it on leather strap. The emery should be finely powdered in a mortar.

DISINFECTANTS.

Disinfectants promise a large sale in the hands of a journeyman in any visited district by an epedemic. When we bear in mind the annual ravages of plague, malaria, influenza, etc., the sale of disinfectants should offer vast possibilities.

1. **Condy's Fluid.**—For this purpose crude permagnate of soda should be used. Condy's Fluid is nothing but a saturated solution of sodium permagnate. It can be put to many uses, but its effect is not very lasting.

2. **Perfumed Disinfectant.**—Take 4 parts of iron chloride ; 5 of zinc chloride ; 5 of aluminium chloride ; 4 of calcium chloride, (bleaching powder) ; 3 of magnesium chloride ; water enough to make 90 parts. Mix well and to every gallon of the solution, add 10 gr. of thymol and $\frac{1}{4}$ oz. of oil of rose, dissolved in 6 seers of alcohol. Filter.

3. **Cheap Disinfectants.**—Plenty supply of fresh air and scrupulous cleanliness are the best disinfectants. Remove articles from the room to be disinfected, and burn 1 seer of sulphur for every 1000 cubic feet of space. Close all the rooms for 24 hours. For disinfecting the manure and excreta, and sewers, use freely

copper solution, prepared by hanging a basket containing 33 seers of green vitriol in a barrel of water.

Disinfectant Fluid or Phenyle.—The popular disinfectant fluid as sold in the market is nothing but saponified creosote. It is popularly known as phenyle. It can be prepared according to any one of the following formulas:

1. In 9 seers of boiling water, dissolve enough of caustic soda to have a specific gravity 1·349 or 38 degrees twaddle (which can be ascertained by means of a hydrometer of this name). Now melt 28 seers of rosin or *sundras* in a big kettle or cauldron. Add 30 seers of creosote; stir well. Add the caustic soda lye. Then add a mixture of 7 seers of black treacle and add 4 seers of methylated spirit. Mix well. Boil until completely dissolved. Stir all the time. Let cool and fill in suitable cans or bottles.

2. Get 7 seers of freshly made hard soap—*karwa* oil soap will serve the purpose. Cut into thin shavings. Dissolve in 21 seers of gas tartar that is derived from the manufacture of coal gas as distinguished from the black pitch or asphalt as is used for tarring the roads. Add 21 seers of caustic soda dissolved in 19 seers of water.

3. Procure 5½ seers of caustic soda of 98 per cent strength or if that be not available, 8 seers of 70 per cent strength, and dissolve it in 24 bottles of warm water. Soda ash or carbonate of soda must not be used. When the whole of the soda has been completely dissolved, dust in 32 seers of powdered rosin or *sundras*. Keep up heating until a homogenous mixture has been made. Then stop heating and pour in 40 seers of oil of creosote. Begin heating once more and bring to boil. Let the whole mass be constantly agitated until a uniform mixture has been made. Creosote is the active principle which disinfects; other ingredients are added to make a rosin soap. Creosote is inflammable and so the mixture must not be boiled over.

The proportions given in the three foregoing formulæ can be slightly altered to suit the market prices.

Imitation Phenyle.—(*a*) Take coal tar distillate (Sp. Gr. 1.00 or over), 100; resin, 85; caustic soda

or potash (30 Be), 60; vegetable oil, 20. Melt resin over slow fire, incorporate thoroughly the coal tar, remove from fire, and while still hot, mix caustic soda and lastly the oil.

(*b*) **Sanitary Soluble Creosote.**—Powdered rosin 225, commercial caustic soda, 50; water, 320; crude creosote (tar oil), 280. Boil soda in 120 parts of water to make a lye. Add rosin and continue boiling till it is melted and saponified. Add remaining water by degrees and then 160 parts of creosote. Decrease heat and stir well. Add remaining tar oil, agitate, cover the pan and let cool and pack in drums.

(*c*) **Sanitary Carbolic Fluid.**—Rosin, 18; caustic soda, 4; crude carbolic acid (30%), 56; water, 20. Make soda lye as above; melt in rosin also as above, taking care not to boil over. When the mixture is reduced to 24 parts, add 32 parts of carbolic acid. For the remainder proceed as the foregoing. Both of these are really rosin soaps.

HULVAS.

Hulva is a Persian word for porridge. It is a delicious and nutritious preparation that is very much relished by all grades of people in India, the peasants consuming on occasion of marriages as much as two or three seers a head. The general base is *suji* or granulated wheat flour. It is often mixed with white flour or *maida* which gives it a better taste but at the same time makes it difficult to digest for the simple reason that it melts between the teeth and does not allow the saliva, *i.e.*, the diatase contained in it, to react upon it and make it soluble. The lightest hulva is made with coarse flour of wheat *i.e.*, *atta*, that having thin consistency being the lightest. The meal pulses, almond paste and pulp of various fruits are also used, the heaviest variety being given by a mixture of the flour of tamarind seeds, scorched and shelled, and *sangharas* (water chestnuts). It is not so easy to digest, but it is most nutritious and body building.

The general way of making the hulva is to get ready a thin syrup of sugar or unrefined brown sugar, called *gur*, sufficiently hot at the time of mixing. Then fry the starchy matter *e.g.*, *suji* with ghee or any other convenient and tasteful oily substance, till a peculiar

smell of the burning flour is given off. Then add quickly the syrup with constant stirring to prevent coagulation or knotting. As soon as the desired consistency has been obtained, the kettle should be taken off the fire. Shelled almonds or peanuts, or slices of cocoanut, raisins, *chalgozas* (pine-cones), chiraunji or other fruits, should be added along with the syrup while small shavings of pistachio should be sprinkled over the mass at the time of serving. Addition of the crushed seeds of cardamom major will add to the flavour. For scenting and increasing the taste, aromatic substances like *keora*, rose water or other scents may be added.

While making the hulva, it is of the utmost importance that the heat applied should be properly regulated otherwise the whole thing may be spoiled. Vigorous stirring in the beginning will prevent knotting, and at the end the hulva from being burnt at the bottom, though slightly burnt hulva, called *khurchan* has a crisp taste of its own and is very much relished by many people.

For making the hulva use only fresh ingredients. The hulva may be made in an open pan or *karahi*, except when fruit juices are to be added, when an enamelled pan or some aluminium vessel should be taken to prevent the acid in the juices to react on iron and give a bad taste as well as brownish colour. No frying will be perfect which does not mask the flavour of the pulses.

Recipes.—1. **Ordinary Hulvas.** *Suji*, 1 lb., ghee, 1 lb.; sugar, 1 lb. This is the ordinary hulva sold in the bazar. To make an inferior quality for sale the quantity of ghee may be decreased, or instead of ghee groundnut butter described elsewhere in this volume may be used. It must be noted that by frying even lower grades of ghee can be used for their odour is often masked..

2. *Suji*, 1 lb.; ghee, 1 lb.; sugar, 20 oz.; almonds crushed shelled and turned into a paste, ¼ lb.; milk, ½ lb; saffron, ½ gramme; nutmeg in powder, ½ oz.; cardamom minor seeds, ½ oz.; aniseed crushed, 2 oz. The saffron and almond paste should be dissolved in milk and added when the frying is complete. The

spices in powdered form should be mixed when the mass has been taken off the fire.

3. **Dates Hulva.** Coarse *suji*, 1 lb.; ghee 1 lb.; sugar, $1\frac{1}{2}$ lb.; stoned dry dates (*Chhoharas*) or better *Pind khajur*, $\frac{1}{2}$ lb.; almond paste, $\frac{1}{4}$ lb.

Pistachio, 2 oz.; condensed milk (*khoa*), $\frac{1}{4}$ lb.; saffron, one gramme; cardamom seeds, 3 grammes.

When the whole mass is ready and has been taken off the fire, two grains of camphor may be added. *These two hulvas are very good for middle-aged people.*

4. Dry dates, 1 lb.; ghee, $\frac{1}{2}$ lb.; sugar, 12 oz.; almonds, 5 oz; pistachio, 1 oz.; cassia leaves, 2; saffron to taste.

Take out the stones from the dates; reduce to a pulp; fry in the ghee; fry the cassia leaves; add syrup and saffron dissolved in water, and then chips of almonds. Let boil. When the desired consistency has been obtained, take off fire, add pistachio in fine shavings. Add 1 grain of camphor.

5. **Gram Hulva.**—Gram meal: ghee sugar, in equal quantities; saffron to taste.

6. **Gram Hulva.**—For people suffering from catarrhal affections.

Ingredients.—Twelve ounces of husked gram, to be boiled soft and ground fine, three cocoanuts scraped and ground smooth, one pound of sugar to be made into a thick syrup.

Directions.—Mix the ingredients together, stir and boil gently till the Hulwa hardens.

7. **Moong Hulva.**—*Moong* pulse, flour, ghee: sugar. Equal quantities.

8. **Superior Moong Hulva.**—Meal of *moong*, 1 lb.; pine cones, $\frac{1}{2}$ lb.; ghee, 1 lb.; *khoa*, 4 oz.; saffron to taste.

Fry the meal, and then the *khoa*; add syrup; boil; and then before the mass thickens, add saffron dissolved in water and also the pine cones.

8 *A*. **Mango and Moong Hulva.**—*Moong* meal, 1 lb.; mango juice, $\frac{1}{2}$ lb.; ghee, $\frac{3}{4}$ lb.; sugar, $\frac{1}{2}$ lb.; *khoa*, 4 oz.; raisins, 2 oz.; almonds, 2 oz.; pistachio, 1 oz.; cassia leaf, 1; saffron to taste; cardamom seeds, sufficient.

Add mango juice and almond after the meal of

moong has been properly fried. After addition of other ingredients, take off the fire and add 1 grain of camphor.

9. **Pea Meal Hulva.**—Pea meal, ghee and sugar, in equal quantities. Dry dates one sixth as much as the weight of ghee, Cardamom major seeds to taste. The dates and syrup should be added when ebullition occurs in frying the meal. The seeds should be added last of all.

9*A*. **Almond Hulva.**—Almonds, 2 lb.; ghee, 1 lb.; cassia leaves or *tamal patra*, 4; cardamom seeds, a sufficiency; saffron to taste; sugar, 1 lb.; raisins, ¼ lb.; milk, 1 lb.

Cook the almond paste with crushed leaves in the ghee until turned brownish; add milk and syrup; add raisins and saffron dissolved in water just before ebullition. Add cardamom seeds when the mass has been taken off the fire. To flavour add one grain of camphor. Very energising.

10. Green peas mashed into a coarse paste, 1 lb.; ghee 1 lb.; sugar, 20 oz.; pistachio, 2 oz.; seeds of cardamom, major or minor, a sufficiency; saffron, 1 gram; camphor, 2 grains.

Fry the peas paste in ghee, add syrup and boil well. Before the mass thickens, add saffron dissolved in water. Add other ingredients on taking the pan off the fire.

11. Meal of small peas, 1 lb.; ghee, 1¼ lb.; sugar, 1¼ lb.; raisins, 4 oz.; saffron and cardamom seeds to taste.

All pea meal hulvas are flesh-forming and should form a regular part of the menu of every vegetarian.

12. **Raisins Hulva.**—Raisins, 5 lb.; ghee, 1½ lb.; sugar 2 lb.; pistachio, 1 oz.; paste of almonds, ¼ lb.; cardamom seeds and chiraunji, to taste. Very delicious.

The raisins should be steeped in water for sometime to wash and free them from dirt, and then fried in ghee. The paste of almonds should be added just before adding syrup.

13. Pistachio, 1 lb.; ghee 6 oz.; cassia leaves 3.; saffron to taste; rose water to flavour. Fry the paste of pistachios and cassia leaves in ghee. Add saffron and singe it. Add syrup and boil. Remove from fire and add rose water. Good for old people.

14. **Dry Fruit Hulvas.**—Almonds, 1 lb.; pistachio, 2 oz.; raisins, 4 oz.; *khoya*, 2 oz.; aniseed, ¼ oz.; cardamom seeds, 2 oz.; cloves, 1 oz.; cinnamon, 2 oz.; saffron to taste; cassia leaves, 2 ; ghee, 10 oz. ; sugar 12 oz.

Fry the almond paste, cassia leaves, the crushed pistachio and *khoa* in the ghee; add saffron dissolved in water and then syrup. Add spices when the mass has been removed from fire. Scrape the bottom frequently, otherwise the whole thing will be spoiled.

15. Pistachio, 1 lb.; almonds, 4 lb.; raisins, 2 lb.; *khoa*,, 2 lb.; saffron to taste; sugar, 4 lb; ghee, 4 lb.; dry dates, 1 lb.

Turn the almonds into a paste, and reduce the dates to a pulp. Fry both in the ghee. Add saffron as indicated in the previous recipes. Add spices on taking off the mass from fire, and add rose water last of all.

16. **Simple Pistachio Hulva.**—*Suji*, 1 lb.; ghee, 1 lb.; sugar, 1 lb.; pistachio, ¼ oz.; saffron to taste; orange juice, 1 lb. Add orange juice along with the syrup. Prepare in an enamelled pan.

17. **Gram and Almond Hulva.**—Green grams, 1 lb.; sugar, 1 lb.; almond, 1 oz.; cardamom seeds, ¼ oz. Very energising.

The grams should be mashed into a paste and fried in the ghee, and crushed almonds added after adding the syrup, and cardamom seeds on taking off the fire.

18. **Mixed Masoor Hulva.**—Red pulse of *massoor*, 1¼ lb.; ghee, 1¼ lb.; sugar, 1¼ lb.; almonds, 6 oz.; dry dates, 2 oz.; raisins, 2 oz.; grape juice, ¼ lbs.; saffron, cloves, cardamom seeds to taste; cinnamon, ½ lb.; milk ½ lb.

Steep the pulse in water over night and reduce it to a pulp in the morning. Singe the spices in ghee and then fry the pulse. When properly fried, add milk and syrup. Add other ingredients as usual. Remove from fire and add some drops of otto rose or otto *keora*.

N.B.—The older the masoor, the less taste and less vitamins it has. Therefore use fresh pulse.

19. **Chestnut & Chiraunji Hulva.**—The meal of water chestnut, 1 lb.; ghee, 1 lb.; sugar, 1 lb.;

chiraunji, 4 oz.; saffron to taste; cassia leaves, 2.

Fry the chestnut meal and cassia leaves. Add well-washed chiraunji just on adding the syrup. On removal from fire some aniseed cleaned from the attaching dirt may be added.

20. **Sweet Potato Hulva.**—Sweet potato (*shaqar-qandi*), 1 lb.; ghee, 1 lb.; sugar, ½ lb.; almond 4 oz.

Bake the potatoes in hot sand or hot ashes. Peel. Reduce the pulp to a paste. Fry in the ghee; add syrup; boil; add chips of almonds.

21. **Apple Hulva.**—*Suji*, 3 lbs.; ghee, 3 lbs.; sugar, 3 lb.; apple juice, 1½ lbs.; almond paste, 4 oz.; cassia leaves, 5; saffron to taste.

Peel the required number of apples; core, cut into pieces; press out the juice with a lemon crusher. Reduce the almonds to a paste. Add these things along with the syrup. Prepare in the usual manner.

22. **Carrot Halwa.**—Strengthening, very good for brain workers and for the heart.

Four seers carrots, five tea-cups sugar, one-eighth pound almonds, two ounces butter, five drops essence of almonds, ten cardamoms. Grate the carrots on a scraper and put to boil with the sugar in half tea-cup of water. When nearly done add the almonds, butter, etc., and cook till all the water has evaporated. Put in a buttered plate and cut into squares.

23. **Potato Hulva.**—Mashed boiled potatoes, 1 seer; ½ seer of Khowa, ½ seer, sugar, Make a thick syrup of sugar, add other ingredients in as fine a state as possible. Stir well and go on heating till the consistency of hulwa has been attained. If syrup of ball consistency is made before addition of ingredients, the whole mass may be set as *barphi* over which crushed cardamom major seeds may be sprinkled. Any dry fruit or fruits or small raisins may be added.—*Commerce and Industry*.

N.B.—Cassia leaves are not to the taste of the Panjabies.

GUAVA JELLY

Guava jelly and cheese.—(1), Twenty seers guavas. Peel the fruit, scoop out the seeds and tie up in a coarse jharan into a deep vessel (aluminium

deckchi best, if no enamel one in use). Cover well with cold water and boil well and stir lightly once or twice. Turn out into a loose jharan or a piece of flannel and allow sysup to drip. The old fashioned style of turning over a chair and tying a cloth to the legs answers as well as any other.

To each seer of juice add ¾ seer sugar, and put on fairly quick fire; when thickening add a wine glass of lime juice or more if necessary. Don't allow to burn and there is no need to add any colouring matter; the jelly gets pink itself as it cools to proper consistency. Allow to cool before bottling.

(2) Of the pulp and seeds left one can make cheese. Pass the pulp through a sieve, squeeze the bag containing the seeds and extract as much pulp as possible. Add ¾ seer sugar to each seer of pulp and cook till it thickens. Add lime juice to taste and a good table spoon of good butter (to each seer); stir all the time and don't allow to burn. When the stuff is almost too stiff to stir, put into buttered moulds.

How to make a plain cake in a few minutes if you have a stove.

Place an aluminium deckchie on the stove; invert the lid and allow to heat with moderate flame.

Take four tablespoons of flour, 1 teaspoon of baking powder; mix dry and put aside. Beat up thoroughly three tablespoons of good ghee or butter, four tablespoons of good fine sugar, three eggs, pinch or two of pounded cinnamon or nutmeg; add flour and stir in quickly; pour into (greased paper) mould or tin and bake half an hour; turn up the flame before putting cake into deckchi, but don't allow the stove to smoke.

CHAPTER XII.

VINEGARS.

The industry of vinegar manufacture can flourish most in cane-sugar or molasses producing districts where instead of taking molasses the cane juice can be conveniently employed. Rotting grapes can also be obtained cheaply from the fruit markets and may be

employed for the manufacture of best vinegar. The *araqnana* of Delhi is nothing but some acetic acid and sulphuric acid and a little of good vinegar added to distilled water.

1. Mix together in 20 gal. of rain water, 2½ lb. acetic acid; 1 gal. of molasses and 1 qt. yeast, Stir well and allow to stand for 1 to 3 weeks. If stronger quality is required add more molasses.

2. Mollasses, 2 qt.; yeast, 1 qt.; soft water, 6 gal. Put in a keg, and put wire gauze over the bung and vinegar and let stand in a warm place for 3 weeks.

3. Acetic acid, 2 lb., molasses, 2 qt., water, 20 gal. Shake and allow to stand 2 or 3 weeks.

4. Cider, 29 gal.; water, 10 gal.; yeast, 2 gal.

5. *Cheap Vinegar,* Put 2 gal. of molasses and two qt. of yeast in 12½ gal, of rain water. Let it ferment. As the vinegar is used, add the above ingredients in the same proportions.

6. A cheap vinegar consists of 25 gal. of warm rain water with 4 gal. of molasses and 1 gal, of yeast. Mixture can be used after it has been allowed to ferment.

7. **Clarifying Vinegar.**—Albumen 3 lb.; neutral tartarate of potassium, 4/5 oz., alum, ½ lb., ammonium muriate, 7 lb. The powder must not be added direct to the liquid to be cleared but should be mixed with soft water. About 20 dr. of this powder is said to be sufficient for cleaning 1 gal. of fluid.

Essence of Vinegar.—Take 20 parts by weight cognac oil, 40 parts acetic ether, 40 parts Maywine essence. Add sufficient alcohol to make up 200 parts. 2 parts of this mixture added to 110 parts of 80% acetic acid make the desired thing.

Maywine essence is wine flavoured with wood-ruff essence. *Acetic acid is popularly known as sirke ka tezab.*

(2) Take some vinegar of any kind in a shallow vessel. Surround the vessel with ice in which some common salt has been mixed. The watery elements in the vinegar will be frozen but the spirituous part will continue to be liquid. This can be poured off. Repeated actions will give additional quantities. In this way a pint of vinegar may give a tablespoonful of vinegar, the quantity depending upon the quality of the vinegar taken. It is very pungent. It should be stored in

air-tight bottles. The essence of vinegar is different from acetic acid, which is obtained by the destructive distillation of wood.

Crystal Vinegar.—Deodorize pickling vinegar as described below with freshly burnt animal charcoal.

Pickling Vinegar.—Take ginger, allspice, capsicum, 1 tola each; curry powder, 2 tolas: black pepper, 4 tolas; mustard seed, 8 tolas; vinegar, 144 tolas. Crush the spices and steep for 48 hours in warm place, previously heating the vinegar.

Distilled Vinegar.—Distil. 7/8 of the vinegar with gentle heat, and dilute the product with distilled water so as to make the specific gravity 1.005.

Ginger Vinegar.—Crush a powa of green ginger root and macerate in 6 seers for a fortnight. Strain. Very good for dyspeptics.

Mint Vinegar.—Take fresh green peppermint leaves and macerate in vinegar for a fortnight in a well closed jar. Strain.

Raisin Vinegar.—Obtain 1 cwt. of raisins from making raisin wine, and add 12 to 15 gallons of water, along with a little yeast.

Vinegar as Cottage Industry.—The organised Western business system has dealt a crushing blow to the vinegar industry in India, otherwise we should not have imported even a drop of this commodity when our country does produce all the ingredients from which vinegar is prepared. England manufactures malt vinegar; France wine vinegar; while on the continent vinegar is produced from beet-root. All these things can be had abundantly in India. Other articles from which vinegar is manufactured are cane juice, paddy, palmyra, toddy, sugar, both brown and white. Raw sugar or *gur* are also employed. Dates, Bengal gram, and many other fruits, chiefly the rose apples, give excellent vinegar. The husk vinegar is manufactured from the husks of fried or scorched black grams. The six-months-vinegar is prepared by mixing certain ingredients with the water in which rice has been washed. It is preserved for six months at the end of which fermentation reduces the liquor into the desired vinegar. It is a very good remedy for dropsy and other ailments. Cheap vinegars are produced by adding acetic acid, to

simple water or to a weak syrup of sugar and has already been described above.

Rose Vinegar for the Toilet.—A few drops of this vinegar added to tub of water will act as an astringent and tighten up the relaxed pores, and at the same time daintily perfume the skin. *It will delay the onset of an early old age.*

Take highly scented roses. Spread them over sheets of waste newspapers. Let them dry in the shade. Put them in a wide-mouthed bottle. For every three ounces of these dried flowers add one pint and three quarters of wine vinegar. Cook and let stand for a whole week. Now pour off vinegar into another bottle. Let all the petals be squeezed to take out the last drop of vinegar. Let stand the vinegar for two or three days, when it can be strained off and kept in closely stoppered bottles.

While putting in the petals of roses, the dried calyx should not be discarded as that contains a lot of scent.

Fruit Vinegar.—To impart flavour of any fruit, the vinegar according to the process given hereunder may be prepared: Put the stalks of quite ripe fruits and weigh them carefully. Put them into large glass or glazed clay jars. For each pound of the stalks taken, add half as much again of pale white vinegar. Tie a tissue paper over the mouth of the jar and let alone for three or four days. Then take out the vinegar and strain the stalks over a muslin cloth back into the jar. Replace the vinegar, and this time add fresh fruit equal in weight to the stalks taken. Repeat this process after three or four days until the flavour and the scent of the fruit has overpowered the flavour of the vinegar. Now strain this vinegar through a flannel or linen bag. Mix an equal quantity of very refined sugar and let it dissolve completely. Heat the syrup over a clear fire. Stir all the time. Boil for about five minutes. Skim all the time. Place a linen cloth over a clean pitcher and pour out the vinegar over it slowly. When the whole liquid has been drained let the pitcher be covered with a clean piece of cloth. Let stand for three or four days. Then bottle. Use velvet corks, but do not fit them tightly for four or five days, otherwise the bottles may burst.

At the end of this period, cork closely and store in a dry and cool place.

ACETIC ACID

Acetic acid or the essence of vinegar is now prepared in many ways which will be described in "Profitable Industries for Youngmen." It occurs in many plants and is most commonly present in fermentation as of gum arabic. It can be produced by the dry distillation of wood which is no longer otherwise useful, *e.g.*, the wood waste in felling timber and in carpentry work. Either the wood may be brought to large stills, eight to ten feet in diameter and 40 to 100 feet long or small stills may be taken to the places where wood waste is available. Two or more of the big stills are placed in a big setting and heated with flue gases from furnaces at a temperature of 400° to 503° C. The resultant product is at a temperature of 200° to 250° C. The wood is placed in trucks and run into retorts. Fairly dry wood yields 25 per cent of charcoal. Charcoal should be at once transferred to a cooling chamber where it should be cooled by sprays of water. Cold charcoal may be separately stored. The distillate is passed through a fractioning arrangement. The heavier tars are condensed separately, and then an ordinary condenser separates the other substances. The gas let out being carbon monoxide is burnt in the fire to raise the temperature. By boiling the tar is freed from water. The remaining distillate, known as pyro-ligenous acid, is then distilled and acetone and methyl alcohol or methylated spirit are obtained. The latter are separated by fractional distillation. To every ten gallons of the remaining acid about four pounds of lime are added. A heavy sludge is precipitated. After settling for a few days, the supernatant liquid is drawn off, boiled down almost dry, and to get acetate of lime in a fine dry state, is run over heated rollers.

Bibliography : Thorpe's Dictionary of Applied Chemistry. Article Wood. Cooley's Cyclopædia of Practical Receipts, Edited by North ; Article Acetic Acid.

An acid sufficiently strong and pure for commercial purposes may be made without distillation, by carefully pouring in a fine stream 60 parts of strong sulphuric acid on 5 parts of water (not water on acid, otherwise the

acid may spurt on the body of the operator), and pouring this on 100 parts of well-dried acetate of lime. Stir the mixture occasionally in a nearly closed glass or stoneware vessel. Decant the clear liquid and strain.

The pure form of the acid is known as Glacial Acetic Acid, so called, as it is crystalline below 16.5° C. (61.7° F.). It is obtained by distilling the ordinary acetic acid with fused calcium chloride and running the distillate into a refrigerator.

Uses of Acetic Acid

Strong acetic acid is corrosive and poisonous. Used externally it is a rubefacient. It dissolves the corns. Diluted it may be sponged over the body to bring down high fever and to check excessive perspiration as in phthisis. Aromatic acetic acid is used in smelling-bottles. The acid is much used in pickling, especially in the form of vinegar which in this country is largely produced by the fermentation of cane-juice or molasses. The white-wine vinegar. commonly known in Delhi as *Araq Nana*, contains nothing but dilute acetic acid and sulphuric acid. The presence of the latter can be easily found out by adding a few drops of the solution of barium chloride which will give a white precipitate. The dyers and calico printers use acetic acid for preparation of acetate of iron or iron liquor and acetate of alumina or red liquor. Many aniline dyes are made with its help. It is much used in photography. The lithographer uses it for etching his stone and the engraver and etcher for biting their copper and zinc plates.

CHAPTER XIII.

Insecticides, Vermin Killers, and Disinfectants.

Ants Exterminator.—(*a*) Sprinkle quicklime on the mouth of the nests, and then pour in boiling water. Use (*b*) turmeric powder, (*c*) powdered borax both for red and black ants. Carbon disulphide poured into nests will kill not only ants but also their larvae (*e*) Cut off the path by drawing a line of coal-tar or kerosene oil.

To destroy Ants.—Drop some quicklime on the-

opening through which they come, and wash it in with boiling water ; or dissolve some camphor in spirits of wine, then mix with water, and pour into their haunts ; or use tobacco water, which has been found effectual. They do not like strong smells. Camphor or a strong sponge saturated with creosote will prevent their infesting a cupboard. (2) Flour of brimstone, ½ lb. ; potash, 4 oz. Set them in an iron pan over the fire till dissolved and united ; afterwards heat them to a powder, and infuse a little of this powder in water, and wherever you sprinkle it, the ants will die, or fly from the place. (3) A few leaves of green wormwood scattered among the haunts of these troublesome insects is also said to be effectual in dislodging them. (4) Boil 4 oz. quassia chips in one gallon of water for ten minutes, and add 4 oz. of soft soap ; or sprinkle pulverised borax over infested places.

Wall-bugs' Exterminator.—(1) Apply carbon disulphide. The bad odour passes off quickly. (2) Spray with solution of carbolic acid. *See Solubility Table* infra. (3) Inject petrol with a syringe into the interstices.

Flit.—It is suggested that a preparation almost approaching Flit may be obtained by preparing a solution of paraffin oil with formaldehyde, carbolic acid and pyretherum. Minimum quantity of the acid should be used as an acid is always a corrosive substance.

N.B.—If in place of pyretherum, mature flowers of pyretherun be taken, the product will be found to be much more effective. Pyretherum was exported from Japan. The War once raised its price to Rs. 140 a seer, and Rs. 3 a tola. the normal rate being Rs. 2-8 a seer. The Panjab Government is trying experiments to grow pyrethrum in Panjab hills.

Ant Poisons.—(1) Aloes, 8 oz. ; potassium carbonate, 1 oz, ; creosote, 1 fl. oz. ; water, 1 gallon. (2) Pour strong solution of carbolic acid in water into the holes. Most will die ; others will fly away. (3) Spread a few green leaves of wormwood near the haunts. (4) Spread turmeric powder near the haunts.

Fungicide.—Copper sulphate, 10 oz. ; quicklime, 6 oz. Dissolve copper sulphate in 1 gallon of hot water and pour into a wooden or enamelled bucket containing 3 gallons of water. Mix quicklime with another gallon

of water and stir well. Mix well both the solutions.

Weed Killers.—(*Poisonous,*) Arsenic, 2 lb.; caustic soda, $1\frac{3}{4}$ lb.; water, 12 gallons. Boil until dissolved. When cool, add crude carbolic acid, $\frac{1}{4}$ pint; common ink, 2 pints. For use, dilute 1 gallon with 25 gallons of water. Label DEADLY POISON.

Weed Killers.—(*Non-poisonous.*) Alum, 7 lb.; green vitriol, 7 lb.; water, 6 gallons. To use, dilute 1 gallon of the mixture with 4 gallons of water.

Bed-bugs.—(*a*) Place the furniture in the strong sun. and beat well. (*b*) Blow in sulphur powder into the crevices of furniture. (*c*) Pyretherum, (*aqarqara*) powder has similar action. (*d*) Close the room well. Remove articles *e.g.*, copper and silver vessels, liable to be injured by sulphur smoke. Burn sufficient sulphur. (*e*) Camphor, 2 oz.; corrosive sublimate, 1 oz. Powder these together. Add alcohol, half a seer, and spirits of turpentine, 4 oz., when using. (*f*) Sulphur flowers. This may be burnt on live coals and the infected objects fumigated. The racks of the bedsteads should be filled with hard soap. (*g*) Corrosive sublimate, 1 oz.; hydrochloric acid, 2 oz.; water, 4 oz. Mix thoroughly and then add one pint of turpentine, decoction of tobacco, 1 pint. (*h*) Pour into the crevices stinking water from the water-cans of Indian hubble-bubbles. A deadly poison may be obtained from *huqqe ki mail* (black deposit in the pipes of the hubble-bubbles. (*i*) Magic cleaner. (See p. 82.)

N.B.—*The decoction of tobacco is made by boiling 1 oz. of bitter tobacco in 1 pint of water. The mixture must be applied with a paint brush. This claims to be a deadly poison. It will command great sale in wet climates.*

For decoction of tobacco, the stinking water in the hubble-bubble may be employed.

Bed-bug Poison.—Camphor, 2 oz.; spirit of turpentine, 4 oz.; corrosive sublimate, 1 oz.; alcohol 1 pint. Mix.

Devil's Bed-bug Killer.—Gasolene, 40 oz.; kerosene oil, 20 oz.; turpentine, 20 oz.; oil of hemlock or of any other bitter substance, 2 oz.; oil of cedar (deodar), 2 oz.; annato or other colouring matter to suit. Never use this mixture near a fire.

Cockroach Powder.*—Borax, 10 oz.; sugar, 3 oz.; cocoa powder, ½ oz. Mix and sprinkle near the place where insects haunt.

Floor Oil.—(*Antidust.*) Paraffin oil, 8 parts; kerosine, 1 part; lime water, 1 part. Mix and sprinkle.

Mosquitol.—(1) Mix citronella, 1 oz., in 8 oz. of karwa or colza oil.

(2) Sweet oil, 3 oz.; carbolic acid, 1 oz. . Mix well. Apply to exposed parts except the hands. Avoid application to eyes. Apply every hour for first three days to saturate the body. Later on less applications or applications at times will do.

(3) Carbonate of lime, 10 grains; water, 1 dram.

(4) Oil of pennyroyal, oil of anise.

(5) Oil of tar, 1 oz.; sweet oil, 1 oz.; oil of pennyroyal, ½ oz.; spirit of camphor, ½ oz.; glycerine, ½ oz.; carbolic acid, 2 drams. Mix. Shake well before using.

(6) **Mosquito Oil.**—Oil of eucalyptus, 1 oz.; oil of wormwood, 2 oz.; oil of cedar, 2 oz.; camphorated oil B.P., 6 oz. 6 dr.

Bamber's Oil for Mosquito bites.—Carbolic acid, 4 gr.; paraffin, or kerosene oil, 2 fl. dr.; oil of citronella, 2 fl. dr.; cocoanut oil, 4 dr.

Lice Lotions.—Borax, ¾ oz.; glycerine, 1 oz.; decoction of quassia (1 in 5), 15 oz. Apply daily. Or naphthalene, 4 drams; white wax, 1½ drams; olive oil or *zaitoon ka tel*, 6 drams; petroleum or *mitti ka tel*, 6 drams; oil of bergamot, 10 drops; oil of cloves, 10 drops; oil of cassia, 10 drops. If oil No. 1 or 2 may not be obtainable add 20 drops of oil of lemon or karna.

Lice Killer.—One of the best remedies for head lice is a vinegar of sabadilla which is prepared by the following process :—

Sabadilla seed ..	.. 5 parts.
Alcohol ..	.. 5 ,,
Acetic acid ..	.. 9 ,,
Water ..	.. 36 ,,

Macerate for three days, express and filter. *Directions for use* :—Moisten the scalp and hair thoroughly at bed time, binding a cloth round the head, and let it remain overnight.

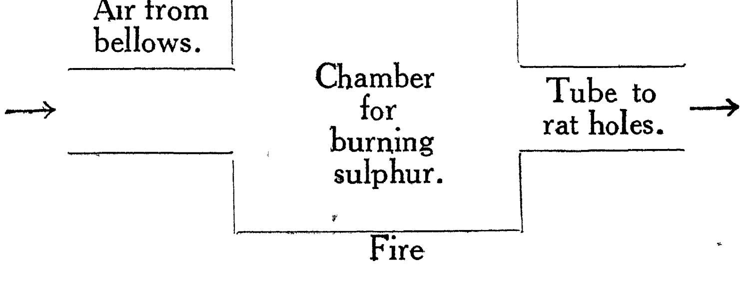
* Cockroaches are white tiddies. They destroy many kinds of fabrics and so they require to be killed. In Bengal cockroaches are big red insects infesting the furniture,

Fly Poison.—Steep $\frac{1}{4}$ ounce small chips of quassia in a pint of water and add 1 ounce of molasses. Flies love this as a beverage., though they can drink it but once.

Fly Paper.—(*a*) Take by weight, 3 parts of boiled linseed oil; gumthus, 1 part; castor oil, 1 part. Heat and mix well; spread while hot on a paper. Venice turpentine or canada balsam may be substituted for gumthus. Castor oil or linseed oil may be increased or decreased according to the climate. (*b*) Powder 1 part of opriment with 12 of sugar: Make a thick syrup and when required spread on the paper. (*c*) A strong solution of white arsenic with sugar pasted on paper. (*d*) Finely powdered and sieved black pepper, 1 tola; brown sugar, 1 tola; milk, 2 tolas. Mix and smear on a paper or plate. To be placed where the flies are most troublesome. Tried many times; does not work. (*e*) Sodium arsenate, 8 oz.; brown sugar, $1\frac{1}{2}$ lb.; water. 1 gallon. Dissolve. Paint on unsized red paper sheets printed with the word POISON in bold letters with the name of the firm. A very good advertising novelty Dip the sheets in the solution. (*f*) Melt the resin and add enough sweet oil, lard or lamp oil so that when cool it is of the consistency of molasses. Spread the mass on writing paper.

Fly Powder.—Powder long pepper, 5 parts; quassia, 5 parts; sugar, 10 parts, and mix well. Moisten with alcohol 68%, 4 parts, and dry. Again pulverise and put in stoppered bottles. For use, place in a dish and set in the haunts of flies.

Rat Exterminators.—(*a*) Arsenic or the tips of red matches mixed with water and flour. Close all vessels of water. (*b*) Fill the holes of rats with sulphur smoke with a special apparatus meant for this purpose. The necessary parts are like this:—



As rats have several secret openings in the fields, care should be taken in closing all other outlets excepting the one into which the sulphur smoke is to be blown. (*c*) Make 5 to 10 gr. tablets of the following composition; cantharides powder, $2\frac{1}{2}$ parts; brown sugar, 4 parts; ground malt, 32 parts; artificial musk, 1 or 2 grains; oil of rhodium, 12 drops; oil of caraway, 6 drops. (*d*) **Rat and Mouse Paste.** Barium carbonate, 10 tolas; biscuit flour, 10 tolas; oil of aniseed, 5 drops. Mix with fat or dripping. The pellets of this paste may be placed near the holes. Rats die outside the building. (*e*) When rats refuse to enter the traps, moisten bread crumbs with a few drops of highly perfumed oil of rhodium. A very strong bait. (*f*) Place moist caustic potash near the holes. (*g*) Barium carbonate, 1 part, flour, 4 parts. Make into a dough. The rats after having taken the meal leave the building in search of water. (*h*) Strychnine (*sat kuchla*) may be dropped in small crystals into the holes or given mixed with food, (g) As the action of this poison is very quick, it should be used only where dead rats can be easily traced. Strychnine powder sprinkled inside fish or meat forms excellent bait.

NOTE.—When laying any of these baits, inform all the children about the danger.

Rat-killer:—(1) Arsenic, 1 oz.; powdered biscuit, a sufficiency; ultramarine, 10 gr.; oil of aniseed, 2 drops.

(2). Arsenic, 1 oz.; crushed linseed, 1 oz.; cassia root, 1 dr.

Rice Bugs, Destruction of.—According to a report of Mr. Lefroy of the Agricultural Department of India the rice bugs often decimate the rice crops. The bugs are of white colour and eat into the rice ears, destroying all the grains. In Southern India they spread ropes soaked in kerosene, crude or turpentine oil over the rice fields and the stretched ropes kill the rice bugs. Another plan adopted at Pusa is to saturate. a bag with crude oil and to carry it over the field, brushing over the upper third of the plant. The bugs as they rise are swept into the bag. At the end of each run the bag is squeezed and emptied over the burning fire. This kills a large multitude of the bugs.

House, Ticks in.—Scrupulous cleanliness of the body and scrupulous cleanliness of the surroundings is the best preventive as well as remedy. Wash frequently the rooms ; expose the beddings, etc., to the strong sunlight. Sprinkle the floor with a decoction of wormwood. Hang near the head a muslin bag full of leaves of pennyroyal. Do not allow dogs and cats to visit the bed room. Drop a few drops of spirit on a piece of camphor and at once reduce it to powder. Sprinkle this powder over your floor. It will afford great relief. The idea can be exploited in the hill stations and in damp places.

Tomato Disease and Its Cure.—America is the home of tomatoes. Till 1907 there was no indication of such a disease. It appears in blackish green spots over the tomato leaves. At first their appearance is irregular but soon it assumes a concentric form, and at last confluent. The leaves are soon killed and roll up and hang loosely from the stem. The fungus also eats into the calyx, the stem and even the fruit. If no remedy be applied, the whole plant may be destroyed within a week of the appearance of the disease. To prevent this disease the plants should be sprayed with a sprinkler with Bordeaux Mixture, according to the formula that follows, in the form of a very fine spray just like dew. To make the mixture, take 3 lb. copper sulphate ; 2 lb. freshly burnt quicklime, and dissolve them in 2 gallons of water. Badly attacked plants should be uprooted and destroyed altogether by burning them carefully, taking care that no pollen from the fungus is allowed to drop on to the unattacked plants. Wires and props drawn over the plants should be drawn carefully through fire to kill all spores attaching to them. The upper soil should be removed and mixed with quicklime, one bushel of lime to every five of the soil. The soil can be replaced after the lime has been slaked. When planting, powdered lime should be sprinkled round the stems. Tomato seeds from infected areas should never be used.

Preservation of Wood.—Creosote, copper sulphate and iron sulphate are very good wood preservatives, but their use is open to objection. The first named agent leaves behind a very bad disagreeable smell, the last two a bad colour. Borax answers the

purpose well. It saves from the rot and at the same time to a certain extent serves as fire-proof. For this purpose, a saturated solution of borax is made and heated to boiling point. Boards of wood are then immersed in this solution and left there for 10 to 12 hours according to the density and size of the boards. Another good preservative can be made by dissolving one part of silicate of soda in three parts of water. The wood is allowed to remain in this solution for a whole day. It is then taken out and dried for several days and the process repeated. When dried at the end of the second process, it is painted over with a mixture of one part of cement and four of the first mentioned mixture. The wood thus prepared will not decay under ground nor burn outside.

Pomegranate trees, Preservation of.—Spray the plants with a very weak solution of alum, 1½%. Not at all harmful even to very tender plants, but very harmful to parasites. Once the parasites have disappeared, make a line of gas tar, 1, tallow, 3, round the stem of each tree. This will keep away from plants worms or other insects.

Unwanted tree, Killing of.—Bore a hole in the trunk of the tree with a carpenter's bit slantwise, 1 to 1½ inch in diameter and 15 in. deep. Insert powder of 2 oz. of nitre and fill the hole with water, and plug it tight. Next spring take out the plug, and put in about half a bottle of kerosene oil. Ignite the trunk; it will smoulder but not blaze. Even the roots will be reduced to ashes. The method is equally applicable to unwanted stumps of trees.

Books, Preservation of.—Cockroaches are the great enemy of books. They lick up portions of the books and leave behind a lot of black mugs. To prevent this any one of the formulas given hereunder may be tried.

(1). Dammar rosin. 2 oz.; gum mastic, 2 oz.; creosote, ½ oz.; Canada balsam, 1¾ oz.; methylated spirit, 10 oz. Place all these things together in a stoppered bottle. The longer the time taken for maceration the better the varnish. The best varnish will be given in six months.

(2). Corrosive sublimate, 1 oz.; carbolic acid, 1 oz.; methylated spirit, 32 oz.

(3). The cheapest way of storing books in closed cases is to leave with them some naphthalene balls.

See also Cockroach Powder on page 150.

Body Powder for Vermins.—Make a tincture by placing 2 parts of hellebore (*karu*) in 10 times its bulk of water and 4 of alcohol and distil. This applied to the body will give great protection against bed bugs, flees and mosquitoes.

Flees, Protection against.—Oil of cloves, $2\frac{1}{2}$; carbolic acid, $\frac{1}{2}$; cologne, 48; distil alcohol, 32. In place of cologne, 1 part of citronella may be substituted. Sprinkle over beddings, beds and bedsteads.

Many more Hints are given in Chapter XI of our forthcoming book, "Labour, Money and Time Saving Devices."

CHAPTER XIV.
LUBRICANTS

Varnishes, Paints, Polishes, Enamels, Shoe Polishes, and Metal Polishes.

N.B.—*All lubricants, paints, etc., in the composition of which oil of turpentine, linseed oil, terebene, naphtha, and other drying agents enter should be kept in air-tight containers, otherwise they will be spoiled and become unworkable.*

Sewing Machine Oil.—Sperm is the best for machines in daily use of tailors and shoe-makers, while for the household petroleum oil mixtures as given below will answer the purpose admirably.

Commercial.—Olive oil, 3 parts; almond oil, 2 parts; rapeseed oil, 1 part; treat with alcohol. In place of olive oil, sweet oil may be taken.

Best.—Pale oil of almonds, 9 oz.; rectified benzoline, 3 oz.; oil of lavender, 1 oz.; Mix and filter.

Common.—Petroleum, 3 oz.; pale groundnut (*moongphali*) oil, 9 oz.; essential oil of almonds, 40 to 50 drops. Proceed as above.

Dynamo Oil.—Refined cocoanut oil, 1 part; 0.885 mineral oil, 1 part; 0.908 mineral oil, 2 parts. Put the cocoanut oil in steam-jacketed pan, then run in the mineral oils. Heat to 170 deg. F. and put on

blower for about ½ hour. Stop heating and let settle. It is now finished. If desired proportion of cocoanut oil may be increased up to double that given above.

Non-corroding Solar Lubricant.—For brass and bronze parts of machinery. Solar oil, 30 parts ; purified rapeseed oil, 20 parts.

Summer Machinery Lubricant.—Tallow, 15 parts ; rosin oil, 2 parts ; rape seed oil, 13 parts.

Winter Machinery Lubricant.—Tallow, 7 parts ; rosin oil, 2 parts ; rape seed oil, 13 parts.

High-pressure Machinery Lubricant.—Take (*a*) Kerosene oil, 10 parts ; rape seed oil, 4 parts ; cocoanut oil, 1 part ; lime, 1 part. Or (*b*) kerosene oil, 10 parts ; rosin oil, 10 parts ; rape seed oil, 5 parts; linseed oil, 7.5 parts ; lime, 2.5 parts. Make a saturated solution of lime and boil together with the oils till a homogeneous paste-like product is obtained. This soapl-ike substance possesses high melting point.

Axle-grease.—(*a*) Tallow, 36 parts ; pork fat. 9 parts ; palm oil, 9 parts ; graphite, 2 parts. (*b*) Tallow, pine rosin, caustic soda, each 50 parts ; linseed oil, 45 parts. Melt rosin, add tallow and linseed oil, and on their forming a homogeneous mass, add caustic soda lye gradually. Stir all the while.

Oil for Cleaning Rifle Barrels.—White oil, 2 fl. oz.; sperm oil, 1 oz.; oil of turpentine, 1 oz.; acetone, 1 oz.

Clockmaker's Oil.—*For clocks, watches and other delicate machinery*. Take refined rapeseed oil or fine olive oil. Mix with 1 per cent of caustic soda by weight for 2 or 3 days shaking the mixture occasionally. Add a large amount of water, let settle and decant or syphon the floating oil. To remove the colouring matters, shake 10 parts of oil so obtained with 2 parts of alcohol, 90%. Cork well the bottles, shake up, and place in strong sunlight for about a fortnight. Shake occasionally, when the water-white oil should be syphoned off and at once filled up in phials. The residual spirit can be purified by means of distillation. (*b*) Put a clean strip of lead in olive oil in a white phial. Place it in the sun till no more sediment is deposited. Pour off carefully the clear white oil. (*c*) Put some oil in a beaker, add double as much 96% alcohol. Shake

well. Cover and keep in a dark place for 24 hours or more. Place in a clean bottle of rain water or distilled water ten times the olive oil. Agitate for 5 minutes, let stand for half an hour, and then freeze like ice-cream in ice and salt, when clean, liquid oil on the top should be syphoned.

Cycle Oil. This is commonly made up of sperm or whale oil, 3 parts, and vaseline, 1 part, by weight. More of vaseline and some mineral oil, *e.g.*, petroleum as thinning agent may be used. (*a*) Refined rape seed oil, *i.e.*, *tara mire ka tel*, 20 parts ; water-white petroleum, 5 parts. (*b*) Camphor, 1 oz. ; castor oil, 2 oz. ; oil, of petroleum, 4 oz. ; olive oil, 20 oz. Dissolve the camphor in the oils.

Cheap Variety Black, for preserving galvanised iron. Melt together in an iron pan coaltar pitch, 7, with coal tar, 1. Gently and by degrees add, ½ of unslaked lime in powder. Raise temperature, stir well. Add lamp black, and boiled linseed oil, 2½ Mix well. Let cool down. Remove from fire. Add slowly coal-tar naphtha, 7 . On being cold ready for use.

N.B.—Put out all lights and fire before using naphtha.

COPAL VARNISH

With Oil of Turpentine.—Oil of turpentine, 1 pint. Set the bottle in a water bath (water boiling in a kettle) and add in small portions at a time 3 oz. of powdered copal that has been previously melted by a gentle heat, and dropped into water. In a few days decant the clear solution. This paint dries slowly but is pale and very durable and is vastly employed for pictures, etc.

With oil.—Pale and hard copal, 2 lb. ; fuse ; add hot drying oil, 1 pt. Boil as directed above and thin with oil of turpentine 1 pint 12 oz. A good drier is made by grinding or dissolving a small quantity of sugar of lead in linseed oil.

Juniper gum or true sandrach (*sundras*) or dammar is sometimes used for manufacturing cheap copal varnish The usual sandrach of commerce is a brittle yellow, transparent rosin from Africa less soluble in turpentine. Its excess renders varnish hard and brittle. Dammar also largely takes the place of tender copal. Hard

copal in its best variety comes from Mexico; the East Indian or African is the tender copal and is softer and more transparent than the other varieties; when it is pure it is readily soluble in turpentine or oil of rosemary.

Copal Varnish.—Melt 8 lb. best copal and mix with 20 lb. very clear matured oil. Then boil 4 or 5 hours at moderate heat, until it draws threads; now mix with 35 lb. oil of turpentine; strain and keep for use. This varnish dries rather slowly, therefore mix it one half with another varnish, which is prepared by boiling for 4 hours 20 lb. clear linseed oil and 8 lb. very pure white rosin, to which is subsequently added 35 lb. oil of turpentine.

For Coach Makers.—Fuse 8 lb. of fine African gum copal, add 2 gallons of clarified linseed oil; boil very slowly for 4 or 5 hours, until very stringy; mix it with $3\frac{1}{2}$ gallons of turpentine; strain and pour it into a cistern.

Mastic Varnish.—Take of mastic, 6 oz.; pure turpentine, $\frac{1}{2}$ oz.; camphor, 9 dr.; spirits of turpentine, 19 oz. First add camphor to the turpentine, the mixture being made over a water bath. When the solution has been made, add the mastic and the spirits of turpentine near the end of the operation; filter through a cotton cloth.

See also Directory, Part IV, articles on Varnish.

ENAMELLING OF TINPLATES.

Enamelling of Tin-plates.—The process of enamelling tinplates consists in painting the surface with the paints given hereunder and then placing the object in a box like oven made of strong iron-plate with a view to bake the paint, keeping the temperature at 175 degrees Fahrenheit.

Silicate Enamel.—To any quantity of pure dry zinc white or good quality pulp colour add sufficient silicate of soda diluted with water to render it of a consistency capable of being easily worked with a brush. One coat will show well, but if a second is applied after the first is thoroughly dry, the result will be much superior. If it be used on articles the size of which will allow of their being stoved at a temperature of 175 deg. Farhrenheit, a surface like porcelain will be the result.

It will be found to equal any enamel of the kind in common use.

Other Processes for Enamelling.—For this purpose Copal Varnish should be employed, the various colours being obtained by the following dyestuffs :—

Blue:—Ultramarine blue, 28 parts : whiting of egg, 14 parts ; China clay, 14 parts.

Sky blue :—Zinc white, 53 lb.; Chinese blue, 1 lb.

Cheapest White Enamel :—Zinc oxide, 7 lb.; ultramarine blue, $\frac{1}{4}$ oz. ; copal varnish, $1\frac{1}{2}$ gallons ; dammar varnish, 1 gal. ; fresh oil varnish, $\frac{1}{2}$ gal.

Yellow :—Pure Naples Yellow, 112 lb. ; copal varnish, 5 gal ; special oil, 5 gal ; turpentine oil, $1\frac{1}{2}$ gal. The special oil referred to above should either be carefully refined and racked linseed oil or pale boiled oil, containing minimum of sugar of lead or borate of manganese drier.

N.B.—The copal varnish used must be genuine copal, warranted free from rosin and soft gums, which will not stand great heat, but soften, thereby gathering dust, and so being spoilt.

Cycle Enamel.—The following is the recipe for cycle enamel :—

Button Shellac	3 qr.
Manilla Copal	1 cwt.
Medium rosin	3 qr.
Nigrosin black	7 lb.
Methylated spirit	45 gal.

Cycle Size :—

Water	110 to 160 gal.
Tallow or Wax	10 to 30 lb.
Farina	112 lb.
Sago	112 lb.
Chloride of zinc, 102 p.c.	2 gal.
Caustic Soda, 70 p. c.	$1\frac{1}{2}$ to 2 pint.

The use of chloride of zinc in the above is optional, but when it is omitted the yarn should be more highly dried in the tapering. The addition of glycerine will improve the sizing.

Blackboard Paint.—Heat to redness 10 tolas of lamp-black on an iron plate, take off, let cool, and crush

to fineness with a spatula and apply with a broad brush. New boards will require two or three coatings of ordinary lampblack in boiled linseed oil before the above paint is applied. The paint should be laid on quickly.

Blackboard Dressing.—Masons more often than not spoil the blackboards by using empiric formulas. The aim of the dressing should be to give a dead black shade quite free from gloss. Before taking up the work in hand, the blackboard should be planed with glass paper, and then a coat applied. When dry, it should be again sandpapered, and a second coat applied. Similarly a third coat may be applied. The ingredients used are lampblack, boiled linseed oil, turpentine and white lead.

(*a*) Coat thinly but evenly and uniformly with lampblack mixed with linseed oil and white lead. Use two parts of linseed oil, for one part of turpentine oil. When dry, paint quickly with a mixture of 3 parts (by measure) of the finest ivory black ground in spirits of turpentine and one part of Japan gold size. If necessary dilute with turpentine. (*b*) Give two coats of black mixed with boiled linseed oil. When dry smooth with emery flour paper. Give a coating with lampblack mixed only with turpentine. (*c*) Coat with ordinary common black paint, and then coat with a mixture of ivory drop black ground in turpentine or copal varnish.

Blackboard Cracks Filler.—If crack more than 1/8 in wide, let the carpenter first do his job before coating with paint. If smaller, fill with a mixture of plaster of Paris, glue, and a little of lampblack. Let dry, scrape, and sand-paper to level with the rest of the board.

Blackboard Varnish.—Sandrach, 6 oz.; shellac, 6 oz.; mastic, 2 oz.; lampblack, 4 oz.; ultramarine, ½ oz.; finely ground emery or very fine sand, ½ oz.; methylated spirit, 3 oz., strain the mass through a piece of fine muslin and apply to boards which have been previously smoothed and are free from grease.

Dead Black Coating for Wood.—Boil together 15 grs. of borax, 15 drops of glycerine, 30 grs. of shellac in 4 oz. of water until dissolved and add 30 grs. of Nigrosine W.S.

Bicycle Paint.—(Black.) (*a*) Mix and dissolve with

the help of heat 10 t. of tar oil, $2\frac{1}{2}$ t. of asphaltum, and $2\frac{5}{8}$t. of powdered rosin. Let not the oil touch the flame. (*b*). Heat to boiling point 8 oz. each of asphaltum and rosin. When all melted, draw off fire and by degrees add 1 lb. of turpentine oil.

Gold Powder.—Let 1 seer of tin be melted in a big crucible, on which pour $\frac{1}{2}$ seer of pure mercury. When the whole mass becomes solid, mix 7 chhtks of flowers of sulphur and $\frac{1}{2}$ seer of ammonium chloride, and reduce to powder.

Mosaic Gold.—Mix tin, 16 parts; flowers of sulphur 7 parts; quicksilver, 8 parts; ammonium chloride, 8 parts. Sublime the amalgam.

Silver Bronze Powder.—Fuse 1 part by weight each of bismuth and tin, and then add 1 part of quick silver. Let cool and powder.

Glossy Black Paint.—Melt 16 oz. of gum amber in $\frac{1}{2}$ pint of linseed oil, add 3 oz. each of true asphaltum and rosin. Mix well over a fire, remove and add 1 pint of turpentine oil slightly warmed over a water bath.

Bronze Paint.—(1) Reduce to powder Dutch metal leaves. Apply with gum water. (2) Grind to a paste by means of linseed oil, verdigris, 8; putty powder, 4; borax. 2 ; mercury bichloride, $\frac{3}{4}$. Fuse by means of heat.

Gold Paint.—Use bisulphide of tin powder. Smear the surface with a layer of prepared glue; let it dry till it is just sticky. "Then over a sheet of smooth writing paper dust on the dry gold powder by means of a stout, soft, sable brush." The gold powder given below may be used.

Gold Enamel Paint.—White-hard varnish, 1 gal; methylated spirit, $\frac{3}{4}$ pint; gold bronze, 12 lb.; finely powdered mica or *abraq*, 3 oz. Mix together alcohol and varnish. Mix mica with gold bronze. Stir in the first mixture.

Leonard's Luminous Golden Yellow Paint.—Strontium carbonate, 1,000 ; sulphur 1,000; pot. chloride, 6; sodium chloride, 5; manganese chloride, 4. Mix and heat strongly for half an hour.

Balmain's Luminous Violet Paint.—Iron free calcium oxide or lime, 2,000 ; sulphur 600; pot. chloride,

5; sodium chloride, 15. Mix dry; heat to dryness and cool.

Gold Paint.—(1). Mix well bronze powder, 2 parts; copal varnish, 2 parts; gold size, 3 parts; turpentine, 4 parts. Apply with a brush. The powder should be kept separately in a bottle and mixed with the liquids as much as required. (2) Coat the article to be painted with terebene and yellow chrome. Let dry. Paint over thinly with gold size. When almost dry dust the gold powder from a bag of linen. Let dry completely, when the superfluous powder can be dusted off for future use. Finish with a coat of white varnish. This will give the appearance of gold leaf.

Oriental Paintings.—For this purpose use any one of the crimson, Prussian blue, yellow lake, white lake rosseau, or No. 40 carmine. Mix with dammar varnish on a glass slab by means of a spatula or table knife.

Directions for Producing the Desired Shade:—
Proportions *for Green*—$\frac{4}{5}$ yellow, $\frac{1}{5}$ blue. *For Purple* $\frac{1}{6}$ crimson. *For Orange,* $\frac{1}{4}$ crimson, $\frac{3}{4}$ yellow. *For Wine Colour,* $\frac{1}{12}$ crimson. *For Pink,* add a little crimson to white zinc. *For Brown,* mix a dark purple and add yellow according to the shade that you require. *For Black,* add crimson to dark green until the desired shade has been obtained. These compound colours may be made darker or lighter by the addition of the darkest or the lightest colours.

Backgrounds.—*For white,* use white zinc or pink white with turpentine and boiled linseed oil and dammar varnish. *For black,* use lamp black with asphaltum varnish, boiled linseed oil, and turpentine in equal proportions. *For flesh colour,* tone white zinc with crimson or chrome yellow till the desired shade has been obtained.

For sketching figures on the background, a little lamp black may be mixed with asphaltum, turpentine oil and linseed oil being added to thin it and make it fluid-enough.

Painting Directions.—Clean immaculately the glass on which you wish to paint. Place it on the picture which is to be copied. With the help of tracing solution, sketch very clearly and distinctly bringing out every line connected with the figure. This being done

lay on the background inside of the sketched lines until all the sketching is closed. The background being dry, begin to put on the colours, beginning with the green, if this be in the figure, and finishing with the yellow. This being over , lay the background on the remainder of the glass. Let it dry. Then have a crumpled tinfoil in your hand. Let it be partly straitened. Lay it over the figure and keep it in position by pasting a paper over it preventing it from slipping. The paper should cover the whole back of the glass. A wood-back may be substituted for the paper.

Fancy Green.—Take unscorched coffee. Powder it. Mix it with the white of an egg shell. In 24 hours it will produce beautiful green.

New Tin Roofs, Very Good Way of Painting. Any rosin adhering to the surface of the tin should be scraped off. Make a strong solution of sal soda in a bucket of water with which wash well the roof. Then wash with clean water after a few hours. When quite dry coat with Venetian red mixed with one third of boiled linseed oil and two-thirds of raw linseed oil. When this coat is dry, a second coat of any desired colour may be applied.

Fire Proof Paint.—The following paint may be applied to roofs etc. Slake limestone in a tub. Cover the tub to keep in the steam. Pass the slaked lime through a sieve, and add one-sixth part of rock salt. To each seer of lime taken add one bottle of water. Boil. Skim. To each five gallons of this mixture, add powdered alum, 1 lb.; powdered iron sulphate, ½ lb.; then slowly add pulverised potash, ¾ lb. fine sand, 4 lb. Now any colour may be added.

Water Proof Oil Rubber Paint.—Collect pieces of old bicycle or motor car tyres or waste footbal bladders. Dissolve 5 lb. of this material in one gallon of boiled linseed oil by means of heat. Should this thicken too much, more of boiled linseed oil may be added ; if too thin, more of Indian rubber may be added. This may be coated on the surface of any *dasooti* and will serve as a very good tarpaulin. Applied to any other stuff, it will equally serve the purpose.

Heat-proof paints.—All colours should be turned into a paste with boiled linseed oil and turpentine.

Ivory white, zinc oxide, 9; light chrome yellow, 1; *Plum colour*; white lead, 1; ultramarine, 1; Indian red, 1 *Olive green* White lead, 3; yellow ocher, 1; ivory black, $\frac{1}{4}$, For 7 parts of such paste, take $\frac{1}{2}$ part, litharge firnely ground, $1\frac{1}{4}$ part, Japan gold size 5/16 part of oil of turpentine, and 5/16 parts of boiled linseed oil. *Procedure*; Give the work two coats of boiled linseed oil; then two coats of the paint.

Asbestos paint.—Incorporate powdered asbestos with crystal varnish. Use 5 to 10% of zinc white.

Brilliant transparent Fire Proof Paint.—Best used over other paint. Mix 84 lb. of clean mica powder with 14 gallons of pale boiled linseed oil. Mica powder is prepared by making mica red hot in crucibles and drawing into water or by boiling mica in dilute muriatic acid.

VARNISHES.

Protective Varnish.—*For laboratory tables against acids and alkalies.*—(*a*) Copper sulphate, 1; potassium chloride, 1; water, 8. Dissolve by heating. (*b*) Aniline hydrochloride, 3; water. 20. Apply (*a*) and then (*b*) Let dry. Next day apply raw linseed oil. To be repeated once a month.

Table Varnish.—(*a*) Turpentine oil, 16; beeswax, 2; colophony 1/8 (*b*) Dammar rosin, 16; spirits of turpentine, 32; camphor, 5/22. Let stand in a well covered vessel for 24 hours; decant the solution and use immediately.

Contour Maps, Composition for.—Use fresh putty or fossil earth and kaolin; or fuller's earth and kaolin. Make into a stiff paste with linseed oil. Size with gelatine solution and paint.

Insulating Varnish for Electrical Goods.—The oxidising varnishes are made from linseed oil with a resinous base of copal or other fossil gum. To expedite the oxidation, use some mineral drier. Non-oxidising varnishes consist in reducing an asphaltum or gum base with a good spirit solvent. Where the wires are not very much exposed, shellac varnish is the best. Wood for battery jars is insulated by immersing it in liquid paraffin. (*a*) Linseed oil, 2; cotton-seed oil, 1; heavy petroleum 2; light coal tar, 2; Venice turpentine, 1; spirits of turpentine, 1; gutta percha, 1/6; sulphur, 2

Heat the oils one by one to about 300° F. and cool to 204. Mix them all, stir in other constituents, sulphur being the last. Heat again to 300° F. for an hour or so until the mixture on cooling is soft and elastic.

Stove Varnish.—Fuse 1 seer of asphaltum in an iron vessel; boil $\frac{1}{2}$ seer linseed oil and add while hot. Mix thoroughly and remove from fire. When cooled a little, add 2 seers of turpentine oil.

Coach Varnish (black).—Melt together asphaltum. $15\frac{1}{2}$ oz.; amber, 40 oz.; rosin $15\frac{1}{2}$ oz.; drying linseed oil, 5/4 pints. When partly cool, add 5/4 pints of turpentine oil heated a little over a water bath.

Earthenware Varnish.—1. Break glass by heating glass pieces and then dropping the same in cold water, when the glass will be broken into very small pieces. Powder this very fine. Mix with equal weight of soda. Dry over a good fire. This powder is spread over the burnt vessels while they are still hot.

Varnish for Terra Cotta.—Gum mastic, 1; shellac, 10; venice, turpentine, 8; strong alcohol 10.

Bottle-Cap Varnish.—Dissolve 3 oz. of red sealing wax in 8 fl. oz. of methylated spirit.

Celluloid Varnish.—Collect broken toys of celluloid and with 1 oz. of the material, mix 8 oz. of acetone and 8 oz. of amyl acetate.

Label Varnish for Paper.—(1) Place 8 oz. of canada balsam on an old plate in the oven overnight when the fire is very low. Remove next morning and dissolve in 15 oz. of oil of turpentine.

(2) Dissolve by gentle warmth 3 oz. of white shellac, 6 oz. of gum mastic, $\frac{3}{4}$ oz. of venice turpentine; 12 oz. of acetone, and 36 oz. of methylated spirit over a water bath. Add $\frac{2}{3}$ oz. of dry kieselguhr recently ignited to suck up moisture and wax. Allow to settle. Then pour off.

Size for Paper Labels.—Immerse 1 oz. of gelatine in 20 fl. oz. of water. Allow to soften and dissolve by gentle heat. Apply only to quite dry labels.

Gold Label Varnish.—Mastic, 2 oz.; sandrac, 2 oz.; venice turpentine, $\frac{1}{4}$ pint; methylated spirit, 1 pint.

Maps, Colourless varnish for.—(1) Dissolve

by stirring 10 oz. of pale dammar gum in a quart of colourless turpentine oil. (2) Fine powder of copal, 3½ oz. should be dissolved by frequent stirring in 1 quart of ether (sp. gr. O. 72) Shake time and again. **N.B.**—Let settle Store in air tight bottles, otherwise on evaporation of volatile liquid the whole varnish will spoil the glaze. See also chapter XVII.,

Cheap Black Varnishes from Coal tar for Painting on Iron.—1. On a slow fire mix carefully, 1 part of asphaltum, 56 parts of coal-tar, and 1 part of fine powdered rosin. Can be applied cold.

2. Mix up 15 gallons of col-tar with ⅔ lb. of lamp black; 3 oz. of tallow; 1 lb. of rosin. Apply hot.

3. Take 14 lb. of newly slaked lime; ⅔ lb. of lamp black; 16 gallons of coal-tar, 1¼ lb of tallow; 10 oz. of resin. Mix thoroughly on slow fire and use hot.

4. Mix 13 oz. of sulphuric acid, 4 pints of turpentine, 2 gallons of coal-tar. Apply hot.

All the above varnishes will dry in an hour or so.

Furniture Polish.—(*a*) Raw linseed oil, 12; alcohol acid, 300%, 3; hydrochloric acid, 3. Mix and let stand for a while. (*b*) Melt 1 lb. of yellow wax and little powder rosin. Heat over a water bath ½ lb. of oil of turpentine. Mix both. Apply with a woollen rag. Gives a beautiful lustre. (*a*) On a slow fire melt yellow wax in a perfectly clean vessel. When melted, add to solution as much pure turpentine. Take off the fire and stir until cold. Use immediately. Brings out the original colour with a varnish like lustre. (*b*) Linseed oil, 40; alcohol, 4; vinegar, 16, antimony chloride, 2; ammonium chloride, 1; spirits of camphor, 1. Place the oil in a large wide mouthed bottle; stir the other ingredients gradually, sal ammonia being the last. (*c*) *White Polish.*—White wax, 1; solution of potash 12. Boil to the desired consistency.

Furniture Polish in Paste form.—The following formulas will yield satisfactory preparations of this class :—

1.	Yellow Wax	4 av. oz.
	Alkanet, coarse powder	½ av. oz.
	Oil of turpentine ..	16 fl. oz.

Macerate the alkanet in the oil for 14 hours, strain and add the solution to the wax previously melted.

The alkanet may be omitted if desired.

2. Venice turpentine .. 6 av. oz.
   Linseed oil .. .. 16 fl. oz.

Mix by the aid of heat over water-bath. The mixture may be coloured by means of alkanet root.

3. Paraffin wax .. .. 7 av. oz.
   Petroleum Yellow .. 5 av. oz.
   Solution of Potassa 5% 5 fl. dr.
   Kerosene .. .. 20 fl. oz.
   Alkanet .. .. .. 2 av. oz.

Heat the potassa with the paraffine and petroleum, add the alkanet root, digest until the liquid is coloured sufficiently, strain through cloth and stir in the kerosene while cooling.

Oil Cloth.—Whiting of egg or powdered cork 13 parts; *kateeragond*, 5 parts; dried linseed oil, 5½ parts; siccative ½ part. Any drier such as litharge may be used. For polishing prepare the following. Melt 5 parts of yellow wax, remove from fire, add 11 parts of oil of turpentine, and then 5 parts of amber varnish.

SHOE POLISHES.

Blackings for Shoes.—Ivory black 120 parts. brown sugar, 90 parts; olive oil 15 parts; stale beer, 500 parts. Mix the black, sugar, and olive oil, into a smooth paste, adding the beer, a little at a time, under constant stirring. Let stand for 24 hours; then bottle in lightly stoppered phials. (2) Gum arabic or *kikar ki gond*, 30 parts; grape sugar, 30 parts; water, 500 parts. The gum and sugar are dissolved in the warmed water, and the solution is gradually mixed with the first mixture. The finished article is filled into bottles.

Cheap Blacking for Boots or Shoes.—Thoroghly mix together finely ground animal charcoal or bone-black with sperm oil. Add to the mass raw sugar (*gur*) or molasses dissolved in a small quantity of vinegar. Then introduce a small quantity of dilute sulphuric acid. This converts a large proportion of the lime in the animal charcoal into sulphate and thickens the mixture into the required consistency. When bubbles have disappeared and the compound is still warm,

pour in vinegar until the mass is sufficiently thinned. Now it is ready to be bottled.

2. Animal charcoal, 5 oz.; molasses 4 oz.; sweet oil, $\frac{3}{4}$ oz. Triturate until the oil completely mixed. Then stir in gradually $\frac{1}{4}$ pint each of vinegar and beer lees.

3. **French Dressing for Shoes.**—Dissolve log-wood extract, 3 tolas in 10 chhtks of water.

Brilliant Blacking for Boots and Shoes.—1. *Ingredients Required*—3 pints, vinegar; 1 pint, black ink; 8 oz. of glue; 4 oz. gum arabic; 4 drams of isinglass. Break up the glue, in an iron pan, pour over it 2 pints of vinegar to soften it. Let it stand till it is completely pulped. In another vessel dissolve the gum reduced to a powder with the inks. Leave aside to be thoroughly incorporated. Melt the isinglass in as much water as would only cover it. Leave it near fire to work for an hour or two according to the weather. When thoroughly melted, add the remaining vinegar to the glue; heat in an iron kettle or saucepan over slow fire, and stir and mix well with the vinegar. On no account should it be allowed to boil. At this stage add ink, and bring it near to boiling point, but not allowing it to boil actually; then add isinglass; remove the kettle from the fire, and then pour off the mass into the pots in which it is to be stored. Before applying, let a small quantity be heated in a small dish and a thin coat applied. Quick drying will give brighter polish.

2. *Another Process*—Turpentine, 66 parts; beeswax, 18 parts; spermaceti, 6 parts; asphalt varnish, 5 parts; powdered borax, 1 part. Boil water in a big pan. Add a pinch of salt to the water. Melt wax over this water bath. Stir in borax to form a kind of jelly. Over another water bath similarly made, melt spermaceti; add to this asphalt varnish, previously mixed with turpentine; stir well. Add this to the melted wax. Take out a little of the mass and triturate it with the inks according to the proportions given in the first formula above. Lastly add 1% of nitro-benzol to impart fragrance.

Waterproof Blacking.—Over a water bath (See above) melt together 2 oz. of suet; 6 oz. of beeswax;

6 oz. of turpentine; and then stir in 6 oz. of ivory black; $\frac{3}{4}$ oz. of indigo in fine powder; agitate the whole mass till nearly set, when pour off in the containers.

Patent Varnish for Boots and Shoes.—1. *Ingredients.* Purified shellac, 3 oz.; gum juniper, 2 oz.; aniline black, $4\frac{1}{2}$ drams; aniline blue, $1\frac{1}{2}$ dram; glycerine, 1 oz. oil of cassia, $1\frac{1}{2}$ dram.; methylated spirit 26 oz. *Process*; Crush the gums, and shake them well for an hour with 1 pint of methylated spirit in a big bottle. Strain. Triturate the aniline colours with glycerine in a mortar; dissolve oil of cassia in 6 oz. of methylated spirit and add the solution to the mortar. Mix well. Pour off the mass into a bottle and slowly add castor oil sufficient. Apply with camel-hair brush.

2. *Ingredients required:* methylated spirit, $\frac{3}{4}$ pint; white wine, 5 pints; powdered gum senegal, $\frac{1}{2}$ lb.; loaf sugar, 6 oz.; powdered galls, 2 oz.; iron sulphate, 4 oz. *Process*: Make a solution of gum and sugar with wine; strain; heat over a water bath, preventing it from boiling over; add galls, green vitriol and white wine; stir for five minutes. Remove from fire. When almost cool, strain through a piece of flannel, and bottle. Apply with a pencil brush. To give extra fine black colour, a little sulphate of iron, half a pint of strong decoction of logwood and 1/16 oz. of pearlash should be added to the whole mass.

Self-shining Blacking.—Lamp Black, $\frac{3}{4}$ dr.; indigo (powdered), 1 oz. Put them in mortar or basin, and rub them with sufficient mucilage made by dissolving gum 4 oz. in strong vinegar $\frac{1}{4}$ pint, to form a thin paste; add very gradually one oz. of sweet oil and triturate until their union is complete adding towards the end the rest of the mucilage. Then further add treacle $1\frac{1}{2}$ oz. and afterwards successively strong vinegar 2 oz., rectified spirit 1 oz. Finanlly bottle for use.

Nubian Blacking.—*Mother-liquid Dye.* Rectified spirit, 1 gal; Blue-blue aniline, 31 dr.; yellow aniline or naphthalene yellow 45 dr.; red aniline or fuchine 8 dr. The proportions of dyes may be varied slightly without affecting the result. Agitate occasionally in the course of twelve hours and filter if there is any deposit. *The Blacking:* Rectified spirit, 1 gal.; mother

liquid dye, as prepared above $\frac{1}{4}$ gal. Mix and add the following : Venice turpentine 11 oz., camphor, 16 oz., shellac, 36 oz. When dissolved add the following solution—Benzine $\frac{1}{4}$ gal, castor oil, $3\frac{1}{8}$ oz.; boiled linseed oil, $1\frac{3}{8}$ oz. Shake well in order to obtain a perfect mixture.

French Polish.—Dissolve 12 oz of reddish-brown shellac to get brown polish (or white shellac to get white polish) in one quart of methylated spirit.

N.B.—To repolish any piece of furniture it should be first scraped, washed with soda solution, and when dry sandpapered before polishing.

Furniture, Cheap polish for.—Give one or two coats of glue or patent size tinted sufficiently with venetian red. Apply hot, rub with a rag gently in the direction of the grains. When dry, rub with cold sandpaper, and without a rag apply French polish (q.v.) Then apply 2 coats of spirit varnish at interval of half an hour.

Self-shining Liquid Creams.—(Black) (1) Procure 8 oz. of gum arabic; 3 oz. of treacle; $\frac{1}{2}$ pint of good black ink; 4 oz. of strong vinegar ; preferably Jullundur variety—avoid bazar vinegar made with acetic acid—2 oz. of rectified spirit, and 2 oz. of sweet oil. The gum should be dissolved in ink, the oil then added and well incorporated. Then add vinegar and lastly the spirit. To be stored in air tight bottles.

(2) Rub together to a fine powder, 3 oz. of graphite with 4 drams of indigo with a mucilage made by dissolving 1 lb. of gum arabic in 1 pint of strong vinegar in the shape of a thin paste. Then put in gradually 4 oz. of sweet oil, and stir them together till intimately mixed. Then add 6 oz. of treacle and then by steps 8 oz. of strong vinegar and 4 oz. of rectified spirit one after the other. Bottle for use.

The above creams should be laid on the boots very thin. All the ingredients are easily available in the market. Every home should have a bottle of its own and only a small quantity should be taken out for use and the bottles securely corked.

Tan Shoe Polish.—Dissolve over a water bath 10 tolas of yellow beeswax, $7\frac{1}{2}$ tolas of linseed oil, and

5 chhtks of turpentine oil. Add $3\frac{1}{2}$ tolas of hard yellow soap shavings dissolved in 7 chhtks of hot water.

Turmeric Brown Boot Polish.—(i) *Ingredients required*: 40 oz. of good malt vinegar; 20 oz. filtered, rain or distilled water; 4 oz. good glue; 2 drams soft soap; 2 drams isinglass.

Process: Colour with annatto or turmeric to the required shade. Water and vinegar should first be mixed, and the glue dissolved in the mixture over a water bath. After adding the other chemicals, let boil from 12 to 15 mts. Store after straining thoroughly. Bottle. Polish with a soft rag or flannel.

(2) *Ingredients*; 8 oz. beeswax; 1 oz. pearlash; 4 oz. best yellow soap (Tata 500 variety will do); 1 lb. of oil of turpentine, 1 oz. of methylated spirit. Water enough to make the mixture of the required consistency. Boil the pearlash in water (add water afterwards if necessary). Add wax and soap in thin shavings. Boil the mixture till a complete homogeneous solution has been obtained. Let cool somewhat. Then put in turpentine and then spirit. Stir well to obtain an intimate product. If necessary add water. *Use*: Rub the cream on the leather. Use soft brush. Polish with a linen rag. *Caution*—Spirit or turpentine added to hot mixture will evaporate quickly. They are added partly to get an intimate mixture and partly as quick driers.

Black Boot Polish (water proof)—Soak 3 oz. of crushed nutgalls (Allepo variety to be prefered) in 1 gallon (6 bottles) of water and extract all the tannin by allowing it gently to simmer over gentle fire. Strain the liquid and again boil. Add 2 oz. of boron and 24 oz. of lac and go on stirring till the whole of the lac has been dissolved and incorporated. Then add 1 dram of aniline black and 3 oz. of ivory black or lamp black. Go on stirring just for a few minutes. Take away from fire and strain through muslin while hot. To be applied with sponge or brush and allowed to dry. The polish should be shaken before use.

Brown Cream for Boots.—Dissolve 3 oz. of soft soap in 8 pints of water to which add 4 oz. Bismark Brown or annatto. Mark it A. Now melt together 2 lb. of yellow wax and 12 oz. of hard paraffin

and add 6 pints of oil of turpentine. Mark it B. Mix A and B both hot. Shake well to emulsify. When cool, add a strong solution of 12 oz. of ammonia. Shake well and bottle.

Black Cream for Boots.—Same as the above cream, but instead of Bismark black, use 2 oz. of soluble extract of logwood, $\frac{1}{4}$ oz. nigrosin and 2 dr. of aniline blue in the case of A. When emulsified add 2 fl. oz. of saturated solution of pot. bichromate.

Black Shoe Polish.—Melt together 4 oz. yellow wax, 2 oz. stearic acid and 2 fl. oz. linseed oil. Add 12 fl. oz. turpentine, 2 oz. 2 dr. ultramarine. Stir until somewhat cool, when add by constant stirring 2 oz. hard soap and 10 fl. oz. of water. If extra brightness is to be imparted, dissolve 8 dr. of nigrosin.

Brown Shoe Polish.—Same as the above, but take yellow ocher (or vilaiti peori) in very fine powder 2 oz. and new sienna, 2 dr. instead of ultramarine, and Bismark Brown instead of nigrosin.

Boot Polishes (Modern Style Paste)—*Brown*—Heat one chhatk of beeswax with $1\frac{1}{2}$ chhtak of turpentine over a water bath, and stir in 5 to 10 grains of Nankin brown stain. The formula can be varied a little ; more or less of ingredients can be taken to suit the individual tastes. For beeswax, half the quantity of beeswax and half of ceresine can be taken. *Black*,—The basis is the same as above, but instead of Nankin brown, take 9 drams of spirit soluble nigrosine. A few grains of aniline black, spirit soluble, will improve the colour.

French Polish.—To one pint of spirits of wine add half anounce of gum shellac, the same quantity of gum lac and a quarter of an ounce of gum sandarac. Put these ingredients into a stone bottle near a fire; frequently shaking it ; when the various gums are dissolved, it is fit for use. Make a roller of wood, put a little of the polish upon it, and cover the roller with a piece of soft linen rag, lightly touched with cold drawn linseed oil. Rub the wood in a circular direction a small space at a time, till the pores are filled up. Then rub in the same manner spirits of wine with a little of the polish added to it, and a most brilliant surface will be produced.

Shoe Maker's Brilliant Gloss.—Obtain small scraps of white leather from saddlers. Add isinglass. Cover with water and boil over a slow fire. Remove. Add a little of oil of turpentine and a tablespoonful each of loaf sugar and bone black. Stir thoroughly. Use when cold. Give two coatings with a piece of soft flannel. To be warmed before use in winter.

To Darken light brown boots.—Procure Propert's dark stain. Apply. Polish then with the darkest brown cream obtaineable in the market.

To Blacken Brown Boots. (1) Make a strong solution of washing soda. Heat. Clean all the dye of the boots with hot soda water with a clean small brush (tooth brush may be used.) Rub the boots with a little of boot repairer's black dye. Let dry. Rub with a little of pork fat; it will make the leather soft. Next apply a good blacking. Polish. (2) Apply hot solution as above, and while yet damp, give a coating of green vitriol solution (not overstrong). Apply two or three similar coatings till quite black surface obtained. Then rub in with hand some ordinary tallow.

Canvas Shoe White Paste.—Powder well some pipe clay in a china tray. Add a little of oxalic acid, and a very small quantity of washing blue. Pour on warm water till paste of the required consistency has been obtained. Well rub into the shoes. Let dry. Rub out excess. Brush lightly.

Ne Plus Ultra Brown Dressing.—Take water 18 litres; rosin oil, $4\frac{1}{2}$ litres; spirits of sal ammonia, concentrated 1.2 litres; white grain soap, 1.930 kilograms; Russian glue (*suresh*) 1.590 kgms.; brown rock candy (brown *misri*) 0.570 kgm.; bismarck brown, 0.070 kgm. Boil all the ingredients together, excepting the pigment or colour After all have been dissolved, add the bismarck brown and filter. The dressing is applied with a sponge.

CAUTION IN MAKING VARNISHES.

Varnishes are best made in open air or in fireproof buildings, otherwise the flames coming in contact with the combustible vapours ignite the latter, and often there is disaster. The varnishes should be made in earthen or enamelled vessels, which should be heated

over water bath, *i.e.*, over water boiling in another iron pan. The gums like sandrac, amber, should be added with constant stiring little by little till completely dissolved.

SOLVENTS EMPLOYED IN MAKING VARNISHES.

For Gums.—Boiled linseed oil, better double boiled. 2. Turpentine oil. 3. Methylated spirit. This is the cheapest solvent, with the exception of water. 4. Wood naphtha. 5. Ether, 6. Coal tar naphtha. 7. Water. 8. Amyl alcohol. 9. Acetone.

For all oil varnishes, use linseed oil. The gum should be added in a very fine powder by melting; for thinning use turpentine. Whenever a varnish thickens it can be diluted with turpentine. The mastic varnish is made by dissolving that gum in turpentine. For spirit varnishes, use methylated spirit. French polish and shellac varnish are made with the help of methylated spirit. Tar or pitch can be dissolved in coal-tar naphtha. For quick drying add wood spirit to all spirit varnishes. Water is used in dissolving gum arabic or in shellac water varnish.

ECONOMY IN MAKING COLOURS.

1. **Prussian Blue.**—(*a*) Weigh a certain quantity of nitric acid. Heat it in an enamelled vessel as hot as can be borne by the hand. Add to it nitric acid little by little, till no more of fumes rise. Then slowly add soft water double as much as the weight of the acid used up. Put in more of iron shavings till no more of them can be dissolved by the acid. The iron shavings can be had from a lathe worker.

(*b*) Make a strong solution of prussiate of potash in hot water. Add this to Solution No. (*a*) as much as would produce the desired tint.

2. **Chrome Yellow.**—(*a*) Dissolve 5 lb. each of lead acetate and Paris-white in hot water.

(*b*) Dissolve 6½ oz. of potassium bichromate in hot water. Pour solution into the Solution. (*a*). Let stand for a whole day.

3. **Chrome Green.**—Get Paris-white, 6½ lb.; lead acetate, 3½ lb.; copper sulphate, 3½ lb.; alum, 10½ lb.; best soft prussian blue, 3½ lb.; chrome yellow, 3½ lb. Reduce to fine powder and triturate well. Add 1

gallon of water. Stir well. Let stand for three or four hours.

4. **Green, Durable and Cheap.**—Colour spruce yellow with a solution of prussian blue and chrome until the desired tint has been obtained.

5. **Paris Green.**—Shake unslaked lime of the finest quality with hot water. Separate the finest part of the powder. Add to this a very strong solution of alum to make a thick paste. Colour it with sufficient quantity of potassium bichromate and blue vitriol to suit your taste.

Cheap Varnish for Mixing with Paints.—The following varnish will dry with a good gloss. Mix one ounce of manganese, red lead or white lead with two gallons of boiled linseed oil. Place in a four gallon pot. Boil quickly over a brisk fire. Agitate well. The longer it boils, the stiffer and quicker-drying the resultant varnish will be. The pot should be provided with a handle which can be lifted with a lever the moment it shows sign of frothing up and going up. The varnish is best made in open air.

Testing Varnishes.—Good permanent varnish is of pale colour and is elastic. It is made from the best white gum. Even temperature keeps it in best condition. Hard drying varnishes dry in five or six hours. They contain less oil and dry much more quickly. To test a varnish, hold a paint brush in both hands. Dip the brush in the varnish in a clean tin, and sharply twirl the handle. If the varnish be good it will produce small bubbles which will float in the air like down.

Leadless Drier.—Precipitate 35 parts of superphosphate of lime and 10 parts of superphosphate of magnesia with soda. This gives an intimate mixture of the phosphates of lime and magnesia. It is very fine, and when dried at a moderate heat is turned into a pale hygroscopic powder. It has great drying power when added to linseed oil. If 10% of pure magnesium borate be added, the drying powers are considerably increased.

Japan Drying Varnish.—1. Boil gum shellac, 3 lbs.; yellow lead, 2 lb.; burnt turkey umber, 2 lb.; red lead, 2 lb.; sugar of lead, 1½ lb., in 4 gallons of

linseed oil, until thoroughly mixed up. This may require about four hours. Remove from the fire, let cool a little, when add spirits of turpentine, 4 gallons.

2. Reduce to a fine powder 7 oz. each of red lead and litharge; raw umber, $2\frac{1}{2}$ oz., lead acetate. 1 oz.; zinc sulphate, 1 oz., and boil with $\frac{5}{8}$ gallon of linseed oil until all are thoroughly mixed up. When a little cool, add $\frac{5}{8}$ gallon of spirits of turpentine.

Varnish for Printing Inks.—To give lustre to the letter press inks the following varnish is often used.

Let one gallon and a half of linseed oil be placed in an iron pot and fired under. A short time after, the oil will, begin to simmer and bubble, but with the increase of temperature the surface will again become calm. Then it will begin to smoke, then boil and give out a very pungent smell. Continuous boiling will produce a scum. At this stage bring a lighted taper over the mouth of the pot to see if the vapours will catch fire; when they do, remove the pot from the fire on to the ground, stirring the contents frequently and allowing them to burn. From time to time take out samples to find out whether half inch long strings are produced. While taking out the sample, the fire should be extinguished, and the pot covered over with a lid. If the test fail, the vapours should be reignited. The indication of threads is a sign of the varnish having been made, when the flames can be altogeher extinguished. *To produce a cheap kind of varnish* the ingredients as given further may be added. On removing the lid as soon as the froth and the smoke have disappeared by constant stirring, add 6 lbs. of rosin little by litte, agitating the mass all the while. Keep ready fine shavings of one and a half pound of brown soap, and as soon as the rosin has been completely dissolved, stir in the soap piece by piece. All soap being in and the froth being over, return the pot to the fire and let the contents boil. Agitate the mass constantly. This being finished take off the pot. The varnish is now ready for use.

LACQUERS.

Deep Golden Lacquer.—Shellac, 3 oz.; turmeric, 1 oz.; dragon's blood, $\frac{1}{4}$ oz.; alcohol, 1 pint. Digest

for a week, shaking from time to time; then decant and filter.

Golden Lacquer.—Turmeric 1 lb.; gamboge, 1½ oz.; gum sandarac, 3½, lb.; shellac, ¾ lb. (all in powder), rectified spirit, 2 gallons. Dissolve, strain and add 1 pint of turpentine varnish.

Red Lacquer.—Spanish annatto, 3 lb.; dragon's blood, 1 lb.; rectified spirits, 2 gallons. Dissolve, strain and add 1 quart of turpentine varnish.

Pale Brazen Lacquer.—Gamboge (cut small), 1 oz.; aloes 3 oz.; pale shellac, 1 lb. Dissolve and mix.

LEATHER POLISHES.

Brown Dressing for Untanned Shoes.—Yellow wax, 30 parts; soap, 12 parts; Nankin yellow, 15 parts; turpentine oil, 100 parts; alcohol, 12 parts; distilled water, 100 parts. Dissolve wax and turpentine oil over a water bath. Dissolve soap and water with heat, and Nanking yellow in alcohol. Mix all while hot, and stir well until cold.

Leather Renovator.—Beat up the contents of five eggs thoroughly and emulsify with oil of birch tar, ¼ flu. oz.; oil of turpentine, 5 oz.; sperm oil, 6 fl. oz. Then add ½ oz. of glycerine, 5 oz. of methylated spirit and ¾ oz. of acetic acid diluted with enough of water to make the whole mass 30 oz. Paint about a teaspoonful of the renovator on the worn surface and rub gently with a soft rag. A few minutes after, polish with a clean rag.

Yellow Leather Varnish.—Dissolve together pale shellac, 5 oz.; sandarac, 5 oz.; gum mastic, 5 oz.; Venice turpentine, 2 oz.; castor oil, ½ oz.; oxalic-acid, ½ oz.; methylated spirit to make 500 fl. oz. Remove all grease and dirt from leather before dressing.

Blacking for Harness.—(1) A water-proof paste may be obtained by dissolving some lac in methylated spirit and colouring it with lamp black. Apply with a piece of soft flannel. (2) *Ingredients*: molasses or treacle, 8; lamblack 1; sweet oil, 1,; gum arabic, 1; isinglass, 1; water, 32, *Process*: Mix intimately, add 1 part of oil of turpentine. Apply as (1) when hard, warm bottle in warm water and on cooling, add a little of methylated spirit.

Patent-leather Varnish.—Resin (*ràl*), 2 oz.; Venice turpentine, 2 oz.; oil of turpentine 2 fl. oz. sandarac, 4 oz.; shellac, 8 oz.; methylated spirit, 60 fl. oz.; lamp black, 1 oz.

To Blacken Worn Leather Bag.—Give the bag a good sponging with warm soda-water,* somewhat strong, but sparingly used and when it has soaked in, give it a coat of good black ink. When this is dry, sponge it again, and give it another coat of ink. When the above has dried in (if it does not want another coat,) rub off all surplus ink with a damp cloth and give it a coat of stale white of egg; an extra coat of this now and then will keep the bag in good preservation. If it can be obtained, use bookbinder's varnish instead of the egg.

Blacking for Harness.—Molasses, 8 parts; lamp-black, 1 part; sweet oil, 1 part; gum arabic, 1 part; isinglass, 1 part; water, 32 parts. Melt all together and when cold, add one oz. of spirits of wine or methylated spirit. The blacking is best applied warm with a sponge. If required the sponge may be warmed by immersing it in hot water.

Leather, Black Paint for.—Clean the leather properly, coat it with alum solution in water, 1 in 20. Let dry, Then get a paint containing 4 oz. of drop black finely mixed with oil of turpentine and ½ oz. terebene. Thin with oil of turpentine, Give a coating with this. When dry, give a coating of drop black and coburg varnish in the form of a cream. *White*:—Instead of drop black, take zinc white, and instead of terebene take lead acetate, ground fine.

Leather Preservatives.—The best preservatives for this purpose are castor oil, cod liver oil and whale oil. Of the first there is an abundance of this oil in India. The second can be purchased cheaply from drugs stores in pound bottles.

Heelballs for Shoe Makers are made of carnauba wax, softened by the addition of tallow or beeswax and coloured with drop black.

* Water in which sufficient sal soda has been dissolved.

Rat-proofing leather.—Make a paste of 2 parts of verdigris with 4 parts of olive or sweet oil. Rub the paste well into the leather.

Dubbing—(*Smearing leather with grease to make them water proof.*) Can be used both for the heels as well as the uppers. Of excellent service in wet places) (1) Boil together 1 lb. of black resin with ½ lb. of tallow and 2 qts. of crude oil *i.e.*, train oil (2) *Ingredients*: 1 pint boiled linseed oil, 8 oz. mutton suet; 6 oz. yellow beeswax; 4 oz. of common resin. Melt all together. Warm leather before fire before dubbing.

N.B.—The latter recipe gives a better preparation.

METAL POLISHES.

In high class polishes for silver and other metals, silica is used as an abrasive; tin oxide or putty powder, rotten-stone or crocus as polishing medium, and petrol, oil of turpentine, suet, kerosene oil, or methylated spirit as vehicle. Always take silica and putty powder in a state of fine division. To ensure success, let the polishing media be reduced to so fine a powder, as may not be perceptible to touch to wash it and to free it from all grit by livigation. (For technical terms, Directory.)

Motor-Car Polish.—Terbene, 1 part; petroleum, 1 part; oil of camphor, 1 part; oil of turpentine, 3 part; linseed oil, 14; parts. The preparation may be coloured with an aniline if desired.

Metal Polish Paste.—Suet, 3 lb.; kerosene 1 gal; levigated silica, 30 lb.; oleic acid, ½ gal.

Metal Liquid Polish.—For gold, silver and plated articles. Levigated silica, 5 lb.; kerosene, $\frac{2}{5}$ gal.; oleic acid, 1 gal.; stearic acid, 1 lb.

Silver Cleaning Solution.—Prepared chalk 4 oz.; solution of ammonia 880, 1 fl. oz. methylated spirit 8 fl. oz.

Six in One Polish.—The same as Magic Cleaner, See Chapter VI. p. 82.

Polish for Aluminium.—Remove grease from the surface of the aluminium vessel which is to be polished with pumice stone or whiting. Then rub polishing brush over a paste made of emery powder with tallow

or suet, and passed over the vessel. Last of all, finish with rouge powder mixed with turpentine.

Metal Polishing Paste.—Wax, 160; raw oleic acid, 5.50. Mix infusorial earth, 350 and mirbane oil, 8.

A Brass Polish.—The following brass polishing paste gives satisfactory results .—Camphor gum, 1 oz.; alcohol, 2 oz.; spirit of ammonia, 4 oz.; spirit of turpentine, 4 oz.; candle paraffin, 1 lb.; clean tallow, 1 lb.; tripoli, 1 lb.

First dissolve the camphor in the alcohol, then melt down the tallow and paraffin and stir in the liquids and the tripoli. Before cooling, the paste can be packed in boxes of sizes convenient to use.

Silver Polish for Tin, Brass, Copper, Bronze etc.—Mercury, tin foil and rotten stone, equal parts. Powder very finely.

Electric Powder.—Of great use to every householed; will give a very bright silver like luster. Take best whiting 4 lb.; cream of tartar, $\frac{1}{2}$ lb. calcined (q.v. Directory), 3 oz. Triturate well. *How to use* :—Use with a soft polish cloth like chamois leather or soft flannel. The cloth should be previously wetted with water. Polish dry.

Silver Powder.—Best for polising copper and plated vessels. Silver nitrate and sodium chloride each 30, cream of tartar. 210. Powder finely; triturate; bottle.

Silver Fluid for Copper and Brasswares.—Precipitate silver, 1 potassium cyanite, $\frac{1}{2}$; hypersulphate of soda, $\frac{1}{4}$. Dissolve water, 40; add a small quantity of whiting. Apply with a soft rag. Shake before using.

Metal Polishes.—(1) *Liquid metal Polish.* Kieselguhr, 56 lb.; paraffine oil, 3 gal; alcohol; $1\frac{1}{2}$ gal; camphorated spirit, $\frac{1}{2}$ gal; turpentine oil, $\frac{1}{2}$ gal; liquid ammonia fort, 3 pints. Pour the ammonia into the oil, alcohol and turpentine, add the camphorated spirit, and mix with the kieselguhr. To prevent settling, stir well all the time during filling. The colour may be turned red by using a little sesquioxside of iron and less kieselguhr. Apply with a cloth and dry. Use another clean cloth or a brush.

(2) **Powder Metal Polish.**—Kieselguhr. 42 lb.; putty powder, 14 lb.; pipe clay, 14 lb.; tartaric acid, 1½ lb. Powder the acid, mix well with the others. For tinting add 42 oz. of oxide of iron, if desired.

CHAPTER XV.

TOILET PREPARATIONS.

TOOTH POWDERS.

For Strengthening.—Burnt alum 4 parts; blue vitriol (*neela thotha*) burnt, 1 part; catechu *kattha* white, 6 parts. Powder and sieve.

2. Soapastone (*sang jarahat or selkhari*), 4; ashes of lentils (*masoor*), 4; rushes (*balchhar*), 2; *kattha white*, 2; burnt betel-nuts, (*supari*), 2. Powder. Add a few drops of carbolic acid. If good colour is required, ashes of betel-nuts may be dispensed with.

3. Charcoal of any wood free from acrid taste and sugar, equal weight. Powder. Add a few drops of clove oil.

4. Sugar, 120, oz.; alum (*phitkari*), 10 oz.; cream of tartar, 2 oz.; cochineal, 8 oz.

5. Bleaching powder, 11 oz.; red coral (*moonga*), 12 oz.

6. Borax (*suhaga*), 50 oz.; precipitated chalk, 100 oz.; myrrh, (*murmaki*), 25 oz.; orris root (*bach*) 22 oz.; cinnamon (*darcheeni*), 25 oz.

7. **Excellent for pyrrhoea** (Tried by the Editor's daughter); five salts (rock salt, sambhar, salt, sea salt, black salt, tube or nali salt); triphala (the three myrobolans—harar, bahera, amla); trikuta (dryginger, black pepper, long pepper), patang; galls (mæju); copper sulphate. All the 14 Chemicals equal weights. Reduce to an extremely fine powder. A very well reputed Vaidic remedy, for strengthening the gums and teeth. Addition of pyretherum (aqarqara) powder and of sodium bicarbonate will greatly improve the therapeutic qualities.

8. **Fashionable Violet Tooth Powder.**—Precipitated chalk, 5 oz. powdered cuttlefish bone, 2 oz.; white sugar, 8 oz.; orris root (*bach*) powder, 1 oz. Add

any good perfume a little. Rinse mouth thoroughly after cleansing the teeth.

9. **Thymol Tooth Powder.**—Thymol, 87 grs.; camphor 60 grs.; rub together until melted, and then add precipitated chalk, 37 oz.; powdered soap, 10 drs.; saccharin 15 grs.; vanilla 7½ grs.; otto of rose to taste, mix well and sift.

10. **Antiseptic Tooth Powder.**—The following tooth powder, containing the antiseptic ingredients of Listerine is popular in some circles. Precipitated chalk, 1 pound; castile soap, 5 drs.; borax, 3 drs.; thymol 20 grs.; menthol, 20 grs.; eucalyptol 20 grs.; oil of wintergreen, 20 gr.; alcohol, ½ oz. Dissolve the thymol and oils in the alcohol, and triturate with the chalk. Sift each ingredient finely powdered through a fin seive and mix all together, afterwards sifting the mixture 5 or 6 times. The finer the seive and the more the mixture is sifted, the finer and lighter the powder will be.

11. **Gibb's Dentifrice.**—Calcii carbonas precip, 29·5; sapo durus reduced to 50 p.c. fatty acid 18·8; glycerine C.P.I. 130 S. gr.; 48·6; saccharin and benzoic acid, 1.08; oil of cloves, oil of carraway, oil of aniseed, oil of peppermint, 2.07 each.

12. **Powdered Dentifrices.**—(1) Acid carbolic, 2 gr.; thymol, 1 gr.; oil, gaultheria, 5 m.; pulv. saponis dura, ½ dr.; sodac bicarb, 1 dr.; precipitated chalk 1 oz.

(2) Acid benzoic, 2 gr.; thymolis 1 gr.; oil cinnamon, 5 m.; pulv. saponis dura. 1 dr.; soda bicarb, 1 dr.; mag. carb. powd. 1 oz.

12. Camphorated Chalk.—Triturate fine powder of camphor, 4 oz., with a little alcohol, and mix well with 16 oz. of precipitated chalk (See Index) and ½ oz. of powdered orris root. Sieve through fine muslin.

SMELLING SALTS.

Aromatic.—Carbonate of ammonia, 8 oz., cut in squares; oils of bergamot, cassia, and of lavender, ½ oz. each; oil of cloves (*laung*), 1 oz. Mix thoroughly in a glass mortar. Put ammonia in small-wide mouthed bottles up to necks. Pour enough of oils barely to cover ammonia. Cork tightly.

Menthol.—Menthol (*phool ajwain*), 10 parts; alcohol, 78 pats; ammonia water, 12 parts. Dissolve the menthol in spitits and add ammonia water.

Antiseptic.—Liquified phenol, eucalyptus oil, iodine solution; 1 fl. oz. each; strong solution of ammonia 2 fl. oz. Mix.

Permanent Smelling Salt.—(1) Ammonium chloride, 2 oz.; potassium carbonate 5 dr. Mix and add essence of Eau de Cologne, oil of neroli or oil of bergamot with 5% glycerine for the powder to remain damp (2) Sal tartar, 3 dr.; ammonium chloride granulated, 6 dr.; oil of neroli, 5 mm.; oil of lavender flawers, 5 mm.; oil of rose flowers 3 dops; ammonia, 15 drops.

Anti-catarrh.—Ammonium carbonate, 1 lb.; strong solution of ammonia, 2 fl. oz.; oil of eucalyptus, 4 fl. dr.; oil of lavender, 1 fl. dr.; oil of peppermint, 2 fl. dr.

Anti-Catarrh Smelling Salts.—Ammonium carbonate, 2 oz.; menthol, $1\frac{1}{4}$ oz.; phenol, 3 oz.; oil of eucalyptus, 15 fl. drs.; solution of ammonia, 5 fl. oz.; sawdust ,a sufficient quantity.

BEAUTY PREPARATIONS.

Dandruff Cure Lotion.—(1) Resorcin, 1 dram; castor oil, 2 drams; balsam of Peru, 1 dram; oil of geranium, 10 drops; oil of lavender, 10 drops; alcohol, 45%, sufficient to make 8 oz.

(2) Olive oil, 2 oz.; bicarbonate of potash, solution of ammonia, tincture of cantharides, 2 drams each. Mix thoroughly. Rub in the scalp and the hair roots. Wash with soft cold water. Apply a little hair oil afterwards.

(*a*) **Hands Whitener.**—Rub the hands at night with a mixture of lanoline, 30 parts; glycerine, 20 parts; borax, 10 parts; eucalyptol, 2 parts; essential oil of almonds, 1 part. Smear the hands; put on the gloves.

(*b*) Mix lanoline 30 parts with bitter oil of almonds, 10 parts. Make a solution of borax, 1 part; glycerine, 15 parts; hydrogen peroxide, 15 parts; and stir into the previous mixture.

(*c*) Take a wineglassful of *eau de cologne*; half cupful of lemon juice. Scrape two cakes of Windsor

Soap to a powder, mix well, then add a teaspoonful of sulphuric acid, put in to moulds, and let it harden.

Moles, To remove,—Take 4 oz. of dried tops of rosemary; 4 oz. dried leaves of sage; 4 oz. dried flowers of lavender; ½ oz.; of cloves; 3 dr. camphor; 6 pints distilled vinegar. Macerate 14 days with heat, and filter; it is then ready for use. Apply a drop twice a day to the moles until they are removed.

To make a Dry Shampoo.—Rectified spirit of wine, 5 pints; distilled water, 3 pints; carbonate of potash, 1½ oz.; liquid ammonia, 1 oz.; glycerine, 12 oz. Dissolve the carbonate of potash in distilled water, then put the ammonia and glycerine in the rectified spirit, and let them stand 15 minutes; then add both together and filter through magnesia paper.

Magic Shampoo.—See Magic Cleaner, p. 82.

Chapped Hands and Skin.—(*a*) Rub in a mixture of white wax, 1; borax, 3; juice of bitter almonds; 1, wheat flour water, 3. (*b*) Milk, 1; chalk 2; glycerine, 1, (*c*) Camphor, 1 dram; boric acid, ½ dr., lanoline, ½ oz.; white vaseline, ½ dr. Make an ointment. (*d*) Mix a little ghee with kneaded flour. Rub the hands with this so that the dirt comes off. Wash with tepid water and then apply glycerine. (*e*) Apply wet powder of myrtle leaves. Remove in two hours and apply castor oil. (*f*) White wax, 4 dr.; spermaceti 18 gr; olive oil, 2 dr.; wear gloves, before going to bed.

Chapped Breasts.—Alum, 1 masha; zinc sulphate, 4 mashas; borate of soda, ½ ratti; rose water, 4 tolas.

Chapped Lips.—(*a*) Mix a little salt in warm ghee, Apply thrice daily. (*b*) Apply the ghee smeared over *chapatis*; also on the navel, (*c*) Apply tragacanth in the syrup of *eesabgol*. (*d*) Apply paste of one sweet almond. (*e*) Clarified honey 2 spoons; any perfume, a few drops.

Corn Cures.—(*a*) Bathe feet in cold and hot water alternately 5 or 6 times, morning and evening. Avoid tight shoes, (*b*) Apply a plaster of rosin plaster, 2 oz.; black pitch, 1 oz.; verdigris, 1 dr.; sal ammoniac, 1 dr. (*c*) Juice of *bhang*, 1; salicylic acid, 10; larch turpentine, 10; collodion, 77. Mix by stirring and add glacial

acetic acid 2. (*d*) Salicylic acid, 1 ; acetic acid ; 1 ; collodion, 8. (*e*) Oxide of zinc, 18 gr. ; cold cream, $\frac{1}{2}$ oz. See also Chap. XXI.

Face Rouge.—Dissolve gum tragacanth in rose water and with the addition of vermillion form a thin paste. Add a few drops of sweet oil of almonds. Place in rouge pots. Dry with gentle heat.

Turkish Rouge.—Alcohol, 1 oz.; alkanet, 1 oz.; Tie alkanet in a muslin bag and macerate in the alcohol for 10 days. Bottle.

BEAUTY CREAMS.

(1). Powdered alum, 80 grams ; white of 2 eggs; boric acid, 5 grams ; tincture of benzoin, 40 drops ; olive oil, 40 drops, gum arabic (*gond keekar*), 5 rattis ; rice flour and perfume as much as desired. Mix the alum and the white of eggs without adding water, in a china dish by very gentle heat. Stir constantly till all liquid evaporates. Guard against coagulation. Let cool. Put in a mortar (*kharal*) ; add the boric acid, tincture of benzoin, oil, gum ; grind together, thickening with enough rice flour to give the desired consistency. Vaseline or glycerine may be substituted for olive oil.

(2) **Orietal Beauty Cream.**—Oil of almonds, 6 oz. ; white wax and spermaceti, 3 dr. each. Melt and add 6 oz. of rose water ; $1\frac{1}{2}$ oz. orange-flower water which may be made by adding a few drops of citronella to distilled water. *This softens the skin.* Apply with cotton cloth.

(3) **Face Bleach or Beautifier.**—Syrup lactic acid, 40 oz. ; glycerine, 80 oz. ; distilled water 13 fluid oz. ; mix and gradually add tincture of benzoin, 3 oz. Colour by adding carmine or *gulanar* dye, 40 gr. ; glycerine, 1 oz. ; ammonia solution, $\frac{1}{2}$ oz. ; water to make 3 oz. Heat this to drive off ammonia, and mix all. Shake, set aside, then filter and add solution of ionone 1 dr. Add a few drams of kaolin (china clay) and filter until bright.

(4) **Skin Salves** *i.e., Skin Bleacher.*—Lanoline, 30 grams ; bitter almond oil, 10 grams. Mix and stir with this salve base a solution of borax, 1 gram ; glycerine, 15 grams ; hydrogen peroxide, 35 grams.

Witch Hazel Snow.—Stearic acid, 60 parts, sodium carbonate, 9 parts ; glycerine, 7 parts ; hamamelis water, 300 parts. Melt the acid in tared vessel sufficient to hold 9 lb. over boiling water in a kettle. Add soda dissolved in as little hot water as possible. Add glycerine. Stir mixture constantly, and gently over a water bath. Now add water to make 300 parts and then hamamelis water. Again place the vessel in the kettle for a minute or two to stir the mixture until quite smooth. Transfer to a warm mortar and beat up foam. Keep aside for 12 hours. Then stir with a broad blade and fill wide mouthed phials. Keeps skin soft and velvety.

HAIR PREPARATIONS

Nitrate of silver dyes that are usually to be found on the market should be avoided as their prolonged use is injurious to the hair. Indian woad (*basma*) is the best hair dye. It is applied in a paste form after the application of henna powder in a similar way. Delay using hair dyes as long as possible. Nature is not unwise in bringing on grey hair. It relieves the pigment cells of their work.

A Harmless Hair Dye.—The dye consists of two liquids used in equal parts. The first is a solution of hydrogen peroxide. The second-consists of metol, 10 parts ; amidophenol hydrochlorate, 3 parts ; sodium sulphite, 5 parts ; alcohol, 500 parts. Dissolve the sodium sulphite in the alcohol, and add the rest of the chemicals. In use equal parts of the liquids are taken, and only as much as is necessary at the time should be mixed. The hair is first freed from grease, etc., by washing with plenty of soap, and thoroughly rinsing ; and after drying, the dye is applied with a comb or a small brush, which can be had at wholesale rates from the market.

Instantaneous Black Hair Dye.—(*a*) Pyrogallic acid, 4 drams ; alcohol, 4 drs. ; distilled water, 4 fl. oz. (*b*) Silver nitrate, 1 dr. ; ammonia water enough ; distilled water, enough to make 1 fl. oz. After dissolving the silver nitrate in 4 fluid oz. of distilled water, gradually add water of ammonia, stirring constantly, until the brown turbidity produced vanishes and the liquid is colourles. Then add enough distilled water to make 10 oz. Excess of ammonia must be avoided as

that produces brownish dye. The hair must have been cleaned with sodium carbonate or common washing soda and hot water, and dried. Solution (*a*) is first applied, and then, while yet moist, solution (*b*), being careful not to stain the skin.

Parisian Elegant Hair Dye, of 3 bottles : I bottle. to contain 25 grains of pyrogallic acid, 4¾ of alkanet, 6 fl. dr. of spirit of wine, and 1 fl. oz. of water. II contains 1 dr. nitrate of silver, 1 fl. dram of liquor ammonia, ¾ fl. dr. of gum arabic, 7 fl. dr. of distilled water. III contains 7¾ gr. of sodium sulphide and 2 fl. dr. of water.

Lead and Sulphur Hair Dye.—Dampen 80 gr. of precipitated sulphur with rectified spirit and mix with 80 gr. lead acetate, and 4 fl. dr. of glycerine. Dilute gradually with equal parts of rose and orange water to make 8 fl. oz.

One Bottle Hair Dye.—(*a*) Pyrogallic acid, 3,000 gr.; hydrochloric acid, B.P., 22½ oz.; distilled water, 32 fl. oz. (*b*) Cupric chloride, 2200 dr.; distilled water, 11 fl. oz.; solution of ammonia, 880, 5 fl. oz. With constant vigorous stirring add 6½ fl. oz of solution of ammonia, 959. When completely mixed add 16 fl. oz. of solution of Hydrogen Peroxide (20 vol).

The chemicals can be had from any local druggist, but in large quantites from reputable dealers in Calcutta or Bombay. In larger quantities still they may be had direct from America.

Walnut Hair Dye.—Preserve the juice of the bark of the tree or of shells of green walnuts in a little alcohol with a few crushed cloves. Digest for a week. Decant and filter the supernatant liquid and add to *amla* Hair Oil Addition of a little common salt will also preserve the juice.

Paris Hair Dye.—Place 8 drams of pure silver in a flask. Add gradually 30 cc. of nitric acid. Place over sand bath and apply moderate heat. Just on the silver being dissolved, add 1 oz. of mercury and 3 fl. oz. of nitric acid, and on the solution being complete, ½ pint, of distilled water. Take off, let clear in a bottle placed in warm place, and seal.

Hair Dye.—The least dangerous black dye, according to the Journal of the American Medical Association, is the old combination, as given below :—

Ferrous sulphate, 6 parts; glycerine 320 parts; water to make 500 parts; mix. After washing the hair and drying it, the solution is brushed thoroughly into the hair, and this procedure is repeated each day for three days. Then, with a fine comb, the solution is applied; gallic acid 0.25; tannic acid 0.25; water to make 50.00.

Cure for Hair Turning Grey in the Young.—It is a disease, and the use of the following pomade has a beneficial effect in preventing the disease from extending and has the characteristic of restoring the colour of the hair in many instances.—Lard, 4 oz.; spermaceti, 4 dr.; oxide of bismuth, 4 dr. Melt the lard and spermaceti together, and when getting cold stir in the bismuth; to this can be added any kind of perfume according to choice. It should be used whenever the hair requires dressing. It must not be imagined that any good results issue speedily: the effects are gradual.

(2) Infuse 2 oz. of hulls of butter-nuts in a pint of water. Add $\frac{1}{4}$ oz. green vitriol. Apply every third day with a brush.

(3) Wash with water in which potatoes have been boiled.

HAIR DYES.

(*According to Ayurvedic system of medicine.*)

1. Take half a seer of colocynth (*Indrayan. Pb tumma*). Express the oil *by Patal Yantra*. Experiment with expression by compression.

2. Boil in one seer of gingley oil, 5 tolas of iron dust, 5 tolas of three myrobolams (*harar, bahera, amla.*) 20 tolas of the juice of Bhangra plant till the whole of water has been evaporated. Decant. Store in well-stopped bottle. Apply now and then at night. Will blacken the hair.

3. *Amla Hair Oil.* The oil that is retailed under this name is more often than not the true Amla Hair Oil. The manufacturer has of course to cater to the public taste which in these days though outwardly

refined is really on health grounds simply depraved. Most of the Amla Hair Oils in spite of loud claims made in advertisements are as remote from Amla in their composition as London is from Lahore. They are simply perfumed oil coloured green.

True Amla Hair Oil is made thus: Take Amla (*myrobolam emblicum*) free from stones, ½ seer. *Mauro* leaves ½ seer, the bark of the Sanaubar root, ½ seer. Pound them well. Boil in water to make a homogeneous paste like preparation. Strain and let settle. Decant, mix equal quantity of the best gingley oil. Boil over slow fire. Take care lest the oil should boil over. For this purpose, the kettle should be big enough. To ensure safety, the oil can be boiled over a water bath. When all the water has been evaporated, take off the fire. When cool add little of the desired perfume and colouring matter. Application of this oil every day will keep the hair black to green old age.

All the above hair dyes are better by far than the European products which invariably contain silver nitrate.

4. *Henna Oil* also keeps the hair black. The Bazar Henna Hair Oil also has no reference to Henna or myrtle leaves. Take one maund of fresh and green myrtle leaves. Sprinkle a little water over the lot. Crush them a little. Boil in half as much water to reduce to almost a pulp Boil the pulp in 5 seers of gingley oil. Proceed as No. 3 above.—*Commerce and Industry.*

DEPILATORIES.

Hair Removers.—(Depilatories) (1) Sodium sulphide, crystallised (*warqiah hartal*), 3; quicklime, 10; starch, 10. Reduce to a fine powder. (2) Equal parts of barium sulphide, quicklime, and starch. (3) Quicklime, 12; sodium sulphide, 24; starch, 8; powdered orris root (*bach*), 4. Make a thin paste and apply for 3 or 4 successive days, increasing the thickness of the layers everyday. (4) Orpiment 1 part; quicklime, 2 parts; starch, 9 parts. Reduce to powder. (5) Stimulate the hair by Spanish flies (cantharides). (6) If hair be thinned, remove scurf by the application of yellow *shakkar* mixed with curd, or bathing with tepid water night and morning, along with constant application of glycerine and lime water during the interval. No hair

oils. (7) Tincture of cinchona, rosemary and of jaborandi 1 part each; castor oil, 2 parts; rum 10 parts. (8) Deodorised petroleum, perfumed by adding 2 drops of perfume to each oz. A little to be rubbed night and morning. (9) Resorcin 1½ dr.; tincture of capsicum ½ oz.; tincture of quillaya 1 oz.; glycerine, 2 dr.; tincture of cantharides, 8 dr.; spirit of rosemary 1½ oz.; rose water, to make 8 oz. Use on hair night and morning. (10) Castor oil, 4 oz; oil of bitter almonds 25 mm. (11) Ashes of myrabolam, 8 oz.; charcoal of poppy-heads, 4 oz.; *kameela*, 1 tola; copper sulphate, borax (burnt), the soot of the roof of grain-scorcher, ashes, 3 mashas each. Mix in *karwa* oil. Use a little night and morning. *For children's baldness and for the boils on head : Kameela, Katha, Geru,* niter, copper sulphate, 1 part each; *murdasang*, pepper, 2 parts each; martyle leaves 4 parts. Powder and mix in *Karwa* oil by heating. (12) Charred tobacco mixed in *Karwa* oil (13) One year old oil of mango pickle. (14) Burnt horse-shoe mixed in sweet oil. (15) Quicklime, 30; orpiment, 4; gum arabic, finely powdered, 60. Triturate. Store in a tightly corked bottle. *To use,* make a paste. Apply to the hair. Let remain for 5 to 10 minutes. Remove with the end of a blade of scissors.

For Hair Removing Soaps, See Chapter VI.

Paste Depilatory fit for filling in collapsible tubes.—Strontium sulphide extra, 34; titanium dioxide, 5; glycerine, 5; petroleum jelly, 3; triethanolamine laurel sulphonate, 1; tyloses 5 in 4% solution, 50; menthol, 1.

Depilatory soap.

The above may be mixed with the composition of any soft soop.

N.B.:—Depilatory soap or paste is more useful than liquid or powdered depilatory.

Most of Depilatories give out disagreable odour which can be masked by mixing some volatile scent. Take care barium sulphide is a deadly poison, and all sulphides have bad smell which can be, however, masked by menthol etc.

HAIR TONICS & RESTORERS.

Hair Restorer.—This is an old-fashioned remedy which has been in favour for many years, and for which

there is a large, popular demand. It was formerly prepared in a very crude manner by adding precipitated sulphur to an infusion of sage leaves but in modern practice milk of sulphur, which is more finely divided than the ordinary form, is used and several other ingredients are added, including acetate of lead, which combines with the sulphur to darken the hair as already noted. The acetate of lead may be omitted, if desired. The complete formula is as follows :—Sage leaves, 1 oz. ; henna leaves, $\frac{1}{2}$ oz. ; milk of sulphur 3 oz ; acetate of lead, $1\frac{1}{2}$ oz. ; tincture of cantharides, 2 oz.; glycerine 1 pint. ; boiling water, 1 gallon.

Pour the boiling water over the sage and henna leaves and let stand until cool, then strain. Rub the sulphur and the acetate of lead together and add the glycerine and cantharides slowly to make a paste. Then stir into the sage and henna liquid. Colour and perfume, if desired. As sulphur is insoluble this will make cloudy mixture which must be labelled:—TO BE SHAKEN BEFORE USE.

To Promote the Growth of the Hair.—(1) Three ounces of olive oil ; three quarters of a dr. of oil of almonds ; 2 dr. of palm oil ; half an ounce of white wax ; a quarter of a pound of lard, and three-quarters of a dr. of the essence of bergamot. This makes an excellent pomade for strengthening the hair, promoting the growth of whiskers and moustaches, and preventing baldness. (2) The following remedy has been tried with success. It will also prevent the hair from turning grey :—Pour boiling water on a quantity of sage leaves and let them remain sometime in an oven or near a stove ; strain and apply to the roots daily with a piece of sponge. A pomade of an equal mixture of cocoanut and olive oils, with or without a little perfume, will be very efficacious with it.

(2) Lead acetate, borax, lac, sulphur, 1 oz. each ; ammonia water, $\frac{1}{2}$ oz. ; spirits, 5 oz. Mix. Let stand for 20 hours. Add 5 oz. of bay rum with finely ground rock salt, 1 tea-spoonful, and soft water, 60 oz.; essence of bergamot, $\frac{1}{2}$ oz. or any other perfume to suit the taste.

Hair, Falling of.—(1) White wax, 10 oz.; fresh rose

and tuberose oil, 1 lb. each; melt the wax in the oils in a water bath on mild fire. Stir while cooling. Apply to hair. (2) Resorcin, 1 dr.; spirit of rosemary. 3 oz.; tincture of nux vomica, 1 oz.; alcohol, 2 oz. Apply to the scalp. (3) Apply mice excreta mixed with vinegar. (4) Boil *lahsooras* in water like a thick syrup. Apply to the scalp. (5) Apply old almond oil. (6) Fry scorpion in sweet oil. Apply. (7) Apply *chaqandra* leaves paste; or burnt frogs mixed with vinegar, or burnt goat horn in vinegar.

Hair Washes Paste.—White good soap, 5 t.*; ammonia water, 12 t.; bay rum or cologne water, 2½ t.; glycerine 2½ t; water, 30 t. Dissolve soap in water by the application of heat and when almost cold, put in the other chemicals by agitation.

Hair Powder.—(*a*) Take very fine powder of wheat bran quite dry, 1 seer; powdered orris root, 10 t. Seive. (*b*) Borax, ½ seer; camphor, 3½ mashas; oil of bergamot, 23 drops. Mix well.

Hair Tonics.—(*a*) Dissolve 8 gr. of sulphate of quinine in a mixture of *eau de cologne*, 2 oz.; bay rum, 2 oz.; alcohol, 4 dr.; and add slowly glycerine, 2 dr.; rose water, $\frac{2}{7}$ oz. (*b*) Dissolve ½ dr. of carbonate of ammonia in 1½ oz. of rain or distilled water. Mix in another bottle tincture of cantharides, 2½ dr.; *eau de cologne*, 10 dr.; rum ½ oz.; oil of lavender, 2 drops. Mix both. (3) Lead acetate, 5 gr. sulphate of quinine, 2 gr.; sal volatile 1 dr.; glycerine, 6 oz.; rain water, 6 oz.; stir well. Apply twice or thrice daily.

Bay Rum.—(1) Oil of bay leaf, 1 fl. oz.; oil of pimento, 40 drops; oil of orange peel, 40 drops; rectified spirit, 6 pints. Distilled water to make 1 gal. Stand for a week and filter.

2. Oil of Bay Leaf, 6 fl. dr.; 1 oz. each of lemon peel, orange peel, and cloves; cardamom. ½ oz; acetic ether, 20 drops; oil of rosemary, 10 drops; rectified spirit to make 4 pints.

(3) Alcohol, 20 tolas; oil of bay, 40 mm.; oil of mace, 1 mm.; oil of orange; 20 mm.; Jamaica rum, 2½ tolas; water to make 40 tolas. Macerate for more

* t Stands for tola.

than a fortnight and filter through magnesia or charcoal which absorbs the colouring matter.

Bay Rum Tonic.—Bay Rum (See above), 10 fl. oz.; tincture of cantharides, 2 fl. oz, solution of ammonia. (880), 2 fl. dr.; glycerine, 1 fl. dr.; water to make 1 pint. Excellent for dandruff and scurf.

American Lotion for Baldness.—Hydrochlorate of pilocarpine 5 gr.; otto of roses 8 m.; oil of rosemary 4 fl. drs. lino of cantharides, 4 fl. drs.; glycerine, 1 fl. oz; oil of sweet almonds, 2 fl. oz.; spirit of camphor, 3 fl. oz.; Mix well and rub well into the scalp, night and morning. It is to be used for some weeks to produce decided effect. On account of cantharides, although most active, it should be used with caution and if the scalp becomes sore its use must be stopped for a time. As a preventive it may be used only once.

Baldness Cure..—Borax, 1 dr.; glycerine 2 dr.; tincture of cantharides, 1 fl. oz.; solution of ammonia, 959, 1 fl. oz.; Distilled water to make 6 fl. oz. Mix and filter bright (2) Water, 20 oz.; pearlash, ½ oz.; onion juice, 5 oz.

Mustache Cream.—Spermaceti, 1; wax, 4; water, 10; gum arabic, 3; good soap, 2; glycerine, 1. Shave the soap finely; powder the gum and make a paste evenly mixed with 2 parts of water. Melt spermaceti and wax over a water bath, add the remaining water and then slowly incorporate the previous paste and lastly the glycerine. Add perfume to suit your taste. Add any colour to glycerine; amber for brown, carmine for red, chlorophyll for green.

Curling Fluid for Hair.—(*a*) Gum arabic, sugar, 1 each; rose water, 16. Dissolve. Use at night. (*b*) Borax, 24; gum arabic, 1; hot water, 128; spirit of camphor, 20. Borax and gum should be dissolved in water. Let cool. Add spirit. Use at night. Before application, strain through flannel.

Hair Curler.—Powdered tragacanth, 2 oz.; powdered borax, 1 dr.; oil of rose geranium, ½ dr.; oil of cinnamon, 6 m.; oil of bitter almond, 2 m.

Mix well, take one teaspoonful of above and half a pint of water. Then apply to hair.

MORE BEAUTY PREPARATIONS.

Cosmetic.—These are preparations to beautify the skin. *Beauty Almond Ball*:—Melt together over a water bath spermaceti, 5 t.; refined white wax, 10 t.; oil of bitter almonds, 20 t. Let cool a little when add essential oil of almonds, 60 drops to expressed oil of mace, 60 drops. Stir it well and when it begins to cool pour in slightly warmed egg-shaped moulds.

Beauty Buttermilk.—Borax powder, 20 mashas; Castile Soap, 32 mashas; cocoa butter (chocolate oil), 6 tolas; cocoanut oil, 32 mashas; water, 10 tolas 8 mashas. Beat up in a warm mortar for about 12 minutes when dilute with 112 tolas of rose water at 40° C. by slow additions. Stir well and perfume with oil of bergamot, 40 mm.; oil of neroli, 10 mm.; vanilla sugar, 20 mashas; all of these previously well mixed together.

Camphor Balm.—Olive oil, 8; pure white wax, 4; spermaceti, 2; comphor, ½. Mix as cosmetic For abrasions, chaps, chiblains, excoriations; as lip beautifier in cold weather; as a hair cosmetic; as mild stimulant and pain killer, when it is rubbed well on the part.

Camphor Ice.—Oil of sweet almonds, 2 parts; spermaceti, 4 parts; white wax, 2 parts; camphor, ½ part. Prepare as above.

Camphorated Cold Cream.—Oil of sweet almonds, 8 fl. oz.; white wax, 1 oz.; spermaceti 1 oz.; camphor, 1 oz.; rose water, 5 fl. oz.; borax (fine powder), 4 drs; oil of rose, 10 drops.

Menthol Cream.—Melt 1 part of wax; add 9 of white petroleum. Take off fluid at once and mix ⅛ part each of menthol, camphor, and boric acid; and 1/16 of thymol. When the mixture stiffens, work it smooth in a mortar. Add any colour.

Camphor Cream.—Omit thymol and menthol from the foregoing.

Cucumber Cold Cream.—Almond oil, 1 seer; green oil, 5 tolas; juice of cucumber, 1 seer; wax and spermaceti, each 5 tolas; essence of cucumber, 10 tolas.

Cucumber Ointment, *See Chapter XXI.*

Glycerine Cold Cream.—Spermaceti, 30 oz. white wax, 1 oz.; oil of sweet almonds, 8 fl. oz.; borax powder, ½ oz.; glycerine, 3 fl. oz.; orange flower water, 1 fl. oz.; oil of neroli, 5 mm.; rose oil, 3 mm. Mix spermaceti and wax over a water bath; dissolve borax in orange water. Have them both at the same temperature, and mix with constant stirring all at once.

Oriental Skin Food.—Oil of almonds, 15 tolas; white wax and spermaceti, each 1 tola; melt as cosmetic (see Index) and add 15 tolas of rose water and 4 tolas of orange flower water. Softens the skin.

Vanishing Cream.—Melt 2 oz. of stearic acid and add to the hot solution of 3 drams of sodium carbonate in 3 fl. drams of glycerine and 10 fl. oz. of water. Heat on a water-bath for an hour. Add small quantities of water to make good the loss by evaporation. Pour into a warm mortar and little by little add solution of Witch Hazel, 4 fl oz.; otto of rose and extract of violet No. 500, thirty drops each; and rose water to make 1¼ lb. Incorporate by constant stirring.

Wrinkle Remover.—Melt together 4 oz. of prepared lard and 1 oz. of lanolin. Strain into a warm mortar. Add 1 fl. oz. of warm water by constant stirring. Then add 4 drops of otto of rose and 30 drops of rectified spirit. To have the desired effect, rub into the skin vigorously.

Brilliantine (separable).—Atoleine, 5 fl, oz.; olive oil, 5 fl. oz. Mix. Let stand for a whole day and night. Filter by means of *Eau de Cologne,* 1 fl. dram; absolute alcohol, 2 fl. oz., rectified spirit, 8 fl. oz.

Brilliantine (non-separable). Castor oil, 10 fl oz., rectified spirit, 30 fl. oz.; concentrated essence of the valley, 2 fl. drams; tincture of turmeric, (1 in 5) enough to colour.

Cold Cream.—Melt white wax. 1 lb.; liquid paraffin, 2 pints; almond oil, 1 pint and while hot add a mixture of 1 oz. of borax in 1 pint of water very slowly. Continue mixing till the mass becomes cool. Then add 30 drops of otto of rose, 2 fl. drams of oil of bergamot, and 15 drops of oil of lemon.

Soothing Cream (To be used after shaving).—

1. Cold cream, 1 oz.; boric ointment, 1 oz.; oil of ylang ylang, 1 drop.

2. Lanolin or hydrous wool-fat, 1 oz.; cold cream, 4 oz.; Eau de Cologne 4 fl. dr.; menthol, 20 gr.

The medical authorities condemn the application of alum after shaving.

Glycerine Balsam (*for whitening and softening the skin.*) and for combating roughness, chilblains, chaps and various other irritations. *Skin Foods,* (*a*) Rose water, 100; glycerine, 25; tannin, $\frac{3}{4}$. Mix well. Rub well into the skin. (*b*) White deodorized petroleum, 7; paraffin, $\frac{1}{2}$; lanolin, 2; borax, $\frac{1}{16}$; rose water, 3. Melt wax over a water bath; add petroleum and lanolin; put in a warm mortar and by agitation add rose water in which borax has been previously dissolved. Any tint may be given (preferably alkanet root or chlorophyll before the addition of rose water). (*c*) Castor oil, 3; alcohol, 5; oil of lavender, 1; oil of bergamot, $\frac{1}{2}$. May be coloured with alkanet root, chlorophyll or carmine. (*d*) Massage of deodorised and perfumed cod-liver oil. (*e*) Massage of casein prepared as follows: Skim the milk, put a little vinegar or acetic acid; heat to 120° F.; strain the whey; wash with cold water and then press out as much water as possible. *Skin rubbed with any one of these foods will grow plump and fat and wrinkles disappear.*

Glycerine Balsam.—This balsam is calculated to soften and whiten the skin, removes roughness, chaps, chilbains.

Get 9 oz. of white wax in a closed earthenware and by means of moderate heat add 3 oz. of best glycerine and $\frac{1}{2}$ oz. of Balsam of Peru. Go on stirring the mixture till it is nearly cold. Too much heat will burn the wax. When cold, pour into suitable pots for sale. If Balsam of Peru be not obtainable, 12 to 15 drops of *attar* of roses may be used.

Glycerine Milk.—A preparation far superior to Glycerine and Rose Water. In a phial, collect Eau de Cologne, 6 fl. dr.; tincture of benzoin, 2 fl. dr.; saponin, 1 gr.; and pour the solution in a thin stream in a mixture made separately of glycerine, 4 fl. oz.; and

5 fl. oz. each of rose water; elder flower water, orange flower water. To colour add solution of cochineal to suit the taste.

Oxygen Talcum Powder.—Take 19 oz. of fine talcum powder and 1 of fine magnesium carbonate powder and 1 of fine powder of sodium perborate. Mix intimately. Add any perfume. Pass through a fine sieve.

Face Powders.—(*a*) Equal parts of gum tragacanth, alum and tannic acid. Powder. (*b*) White talcum, 2; refined kaolin or china clay, 2. (*c*) Magnesium carbonate, 6; zinc oxide, 35; talcum, 59. Add any perfume. Any colour may be added *e.g.*, for pink, ammoniacal carmine; for yellow use yellow ocher. (*d*) Corn starch, 7; rice powder, 1; talc powder, 1; orris root powder, 1; extract of jassamine, 1; any other perfume may be added. The powder should be sifted through fine muslin. (*e*) Zinc oxide, 4; rice powder, 14; precipitated chalk, 4; talcum powder, 2; orris root powder, 2. Add any perfume. Prepare as (*d*).

Face Enamel.—Freshly precipitated moist zinc carbonate (containing about 20%); glycerine, 10 drops; trefle blanc, 4 drops. When spread on the face, it will leave a semi-transparent layer. To perfume, use four drops to each oz. concentrated Lilac Essence or Violet Essence or White Rose Essence.

Theatrical Wet White.—Zinc oxide, 4 oz.; prepared talc, 3 oz.; light magnesium carbonate, 1 oz.; glycerine, 2 fl. oz; Violet Essence No. 500, 30 drops. Rose water to make 1 pint.

Violet Powder.—1. Powdered starch, 13 oz.; powdered boric acid, 2 oz.; zinc oxide, 1 oz.; oil of ylang ylang, 4 drops; otto of rose, 1 drop.

Perfumed Bathing Powder.—Starch, 128; orris root, 64; camphor, $2\frac{1}{2}$. Let all be powdered, and stirred into a bath by enclosing the powder in a piece of linen or coarse khadder.

2. Powdered starch, 14 oz.; powdered orris, (*bach*), $\frac{1}{2}$ oz.; powdered boric acid, $1\frac{1}{2}$ oz.; oil of bergamot, 8 drops; oil of lemon, 2 drops. Sift the prepared powder twice through a 120-hole sieve. The colour

and perfume should be mixed with a part and then triturated with the whole.

Nursery Toilet Powder.—Corn flour, 1 lb.; kaolin in fine powder, 1 lb.; boric acid powder, 4 oz.; zinc oxide, 3 oz.; talcum powder, 8 lb.; 20 drops each of oil of lemon, oil of lavender and terpinol.

Shaving Powder.—Used after shaving. Starch, 5; precipitated chalk, 10; talcum powder, 2; perfume to suit. Triturate well and sift through a piece of muslin. To perfume add oil of neroli, citron, orange or of jasamine.

Shaving Cream.—Shaving creams are usually made from stearic acid and cocoanut oil, as a very superior product is obtained by the use of these substances. Moreover by using these a very satisfactory cream is obtained, and it is far more convenient to make. The lather also produced therefrom is more suitable for shaving, being thick, creamy and remaining moist. A typical formula for shaving cream is :—

Cochin cocoanut oil	26 lb.
Stearic acid	165 lb.
Caustic Potash lye, 50 B.	69 lb.
Glycerine C. P.	76 lb.
Water	38 lb.

The cocoanut oil and glycerine are first put into a suitable mixing apparatus or finely crushed, and heated to 120° F. A part of the potash lye is then added and the co-coanut oil saponified. The rest of the potash lye and the water are then added and with the mixer running the stearic acid, previously melted in a lead lined or enamelled vessel is then poured in a stream and the mass stirred until smooth, care being exercised not to aerate it too much. When the proper neutralization has taken place the cream is perfumed and framed in a special frame or it may be allowed to cool in the mixer and perfumed the next day. When cool, the cream is strained, or put through an ointment mill, after which it is ready to be filled into tubes.

Shaving Cream.—The oils or fats taken for this purpose should be the purest possible. If they are not perfectly fresh and clean, carefully boil the substance in a clean kettle, together with a solution of water and salt, which may be afterwards strained.

(2) Lard, 11 oz.; caustic potash, 13 drams : water, 4½ oz.; alcohol, 4 dr.; white of one egg; oil of bitter almonds, 10 drops. Dissolve potash in the water and mix with lard in a *kharal* or mortar. Set aside for 12 hours. Add the oil, dissolved in the alcohol and the white of the egg, heating the mass until it becomes pearly in appearance.

(2) Lard, 4 oz.; cocoanut oil, 12 oz.; dried and powdered castile soap, 2 oz.; solution of caustic potash, 8 oz.; citronella or oil of neroli, 5 drops; oil rose, 30 drops. Heat together the lard, the cocoanut oil, and the lye of potash, for several hours at 100°C. Sieve the powdered soap upon the mass and thoroughly mix it. When it has been cooled, add the perfume, and transfer to suitable vessels so as not to allow the perfume to evaporate.

Lip Beautifier.—(*a*) Paraffine, 2; vaseline, 2; oil of lemon, oil of violet, each 1½; carmine to suit. Prepare over a water bath. (*b*) *In sticks*—Precipitated chalk, 8; carmine, ⅙; spermaceti, 16; white wax, 10; oil of almonds, 32; perfume to suit. Dissolve the colour in enough of ammonia water and mix with chalk. Melt waxes over a water bath, stir in the chalk, take off the fire, add perfume, and put in stick-shaped moulds.

Lip Salve.—Spermaceti, 1 oz.; white wax, 2 oz.; almond oil, 6 fl. oz.; alkanet root, ½ oz. Digest the chippings of the root in almond oil for a week. Tie the chippings in a muslin bag, for half an hour, strain through flannel. Add oil of lemon, 20 drops; saccharin, 1 gr.; citric acid, 2 gr.; water, 2 drops. Stir until nearly cold.

Mouth Washes.—(1). Chewing of betel-leaves sweetens the breath but in some people, it destroys the enamel of teeth, (2) Remove constipation and clean teeth regularly every morning with a tooth stick or tooth-brush. (3) *Antiseptic mouth wash.* Thymol, 4 gr.; benzoic acid, 14 gr. tincture of eucalyptus, 225 gr.; essence of peppermint, 9 gr.; chloroform, 15 gr.; alcohol, 3 gr. Mix. Dose : 20 mm. in a glass of water once. (4) *Mouth Pills.* Extract of liquorice, 1 oz.; oil of cloves, ½ dr., oil of cinnamon, 5 mm.; moisten 1 gr. pills of sugar with this. One pill at a time,

(5) Disinfect the mouth and throat with a solution in water of thymol or phenol sodique (which see).

Sozodont.—A much advertised mouth wash: Soap 5; glycerine 6; spirit, 30; water, 20, Flavour with any suitable perfume; colour; mix with chalk or magnesium carbonate if desired.

Sozodont Fragrant.—Tincture of soap bark, 4 oz.; tincture myrrh, 2 dr.; glycerine, 1 oz.; water, 3 oz.; essence of cloves, 40 drops; essence of winter-green, 40 drops, tincture cochineal or extract alkanet enough to colour. Mix well. Before using this mouth-wash, use anyone of the tooth powders given above in this chapter.

Household Ammonia.—Castile soap, 1 dr.; solution of ammonia 3%, 1 pint. Add 5 drops of Eau de Cologne oil or any other perfume to taste. Tap water or any soft water should be used in making solution of ammonia.

Perfumed Betel-nuts.—The nuts are pulverised, mixed with glycerine, coloured a little pink with any harmless colour, as carmine or cochineal and perfumed with menthol, eucalyptus oil etc.

Dusting Powder.—Powder together, menthol, 5; thymol, 5; boric acid, 200; a little perfume. Pass through a No. 80 sieve.

Antiseptic Foot Powder.—Boric acid, 15; zinc oxide, 1; sterilised talcum, 2; oil of eucalyptus or of thyme, a little.

Graham's Bloom of Roses.—An excellent preparation to impart a ruddy glow to the face.

Can be prepared by taking powdered carmine (best quality) 4 drs., digested for two days with 8 oz. of strong ammonia in a tightly stoppered bottle. Then add two pints of rose water and 8 oz. of essence of rose. Let the liquor stand for a week to settle, then it may be poured off from the sediment and bottled.—*Commerce and Industry.*

Lemon Juice skin food.—Fresh lemon juice, 2 oz., glycerine, 1 oz.; rose water or rain water with just a few drops of otto roses to make 20 oz. Rub on the hands and face thrice or four times a day and before washing; let it dry.

The secret of keeping a beautiful young complexion unto the green old age lies in using some preparation containing lemon juice. Addition of juice of one lemon to a bath tub will equally serve the purpose This priceless secret ought to be made the basis of starting a big industry in C. P. where lemons grow so plentifully. Further hints on commercialisation of this paying proposition to respectable capitalists on application to the Editor of this work c/o The publishers of this book.

Lemon cream for sunburns.—Let 2 spoonfuls of fresh cream be stirred with half a pint of fresh milk. Pour into the milk the juice of one lemon, then half a glass of brandy, a little alum and some loaf sugar. Boil the whole lot. Go on skimming. Let cool. Ready for use. Can be made everywhere.

Skin softener.—Bitter almonds finely powdered, 1 oz.; barley meal, 1 oz.; add enough honey to make a paste.

N.B.—Bitter almonds can be distinguished from sweet almonds very easily. The pith of bitter almonds is light yellow, of sweet ones, dark brown. A cheap substitute, though not as good for bitter almonds is the pith of peach stones.

Rose Powder for every day use.—Better than rouge. Gives a delicate colouring to the skin. Absolutely harmless. Easy to make. Sifted starch. 1 oz.; rose pink, ½ dr., magnesium carborate, 1 oz.; essence jasmine, 20 mm.; otto roses, 6 mm.

Pearl Powder.—Procure mother of pearls from the sea shells. Then take pure pearl white and French chalk both reduced to a very fine powder, equal parts. Add scent to taste.

Cutex or Nail paint.—Washed, cleaned and shredded celluloid sheet or photo film as basic material for deposition of enamel on the nail (used up photo film will answer the purpose) 2 parts amyl acetate, as solvent, 13 parts; acetone, 6 parts; methyl ether, 1 part; benzyl alcohol, as fixative and plasticiser, ½ part; Gum (as an adhesive), 1/10 part; Eosine Red, Collaquer Pink 74194, or Collaquer Carmine 99996, or collaquer Rose 75079 or Collaquer Ruby 81446, sufficient to produce

the desired shade. *Process.*—Wash the basic mateiral with solution of washing soda. Dissolve in anyl acetate by stirring for two hours or so. Add acetone and other solvents. Stir. Let alone for an hour. Next morning the solution will be complete. Add gum. Shake well. Add colour in solution. Add alcohol, if necessary. Cork tightly. Avoid heating or lights.

Nails Wash.—Tincture myrrh, 1 dr.; dilute oil of vitriol, 2 dr.; spring water 4 oz. Dissolve, putting the acid into the water and not the water into the acid. Thoroughly cleanse the nails and then dip them into the lotion.

Nails Dirty, To cleanse.—Coloured or stained nails can be cleaned with a little weak acid, *e.g.*, lemon juice, vinegar or tamarind water.

Nails, To Colour.—Wash the nails with Hamam soap. Rub them with mixture of cinnabar and emery powder, taken in equal quantities. Rub with oil of bitter almonds.

Foot wash to overcome offensive smell.—(1) Before retiring wash the feet with warm water, with the addition of a little muriatic acid and a little bleaching powder *i.e.* chloride of lime. (2) Use foot bath containing borax or a weak solution of potassium permagnate.

Scalp Cleaner.—(1) The Indian barbers often rub off the edge of a mango stone against a stone slab, take out the kernel, and with the hollow shell rub the scalp. (2) Pot. carbonate, 2 oz.; ammonia water, 1 oz.; alcohol 8 oz.; water enough to make 16 oz. Wash the head with warm water; pour sufficient solution on the hair to produce a good lather; rub again, wash with warm water. Dry.

CHAPTER XVI

PERFUMERY.

This is indeed a very wide subject and cannot be dealt within the small space at our command. Some brief hints are however given. The flowers should be plucked early in the morning and as soon as possible put into the still. The question of heating is very im-

portant. Too much heat results in less yield of the otto. The neck of the retort should be thoroughly cooled by running a stream of cold water. The old country *babhkas* do not produce all the otto present in the flowers. If a worm-wood condenser be employed the yield is greater. The otto should be extracted either just near a well or a water pipe where a constant supply of water can be had. Best roses can be had in Lahore. Mirzapore, and Choa Saidanshah; Keora ears, in Hyderabad Dec. and in many other cites in the South; *khas-khas,* (vitivert) from Bikaner.

If one were to obtain pure otto it would cost very dear. All the perfumers pour the desired quantity of sandalwood oil in the still. The otto together with the sandalwood oil distils over. Let the liquid cool in a covered vessel, when the otto so got should be placed in bottle and let settle. Then the otto can be decanted first from a big beaker and then placing the resultant otto in a burette. Atmost all the water can be thus drained off.

The lavenders are nothing but alcohol or rectified spirit perfumed with the desired odour. Remember that oil cannot be dissolved in water but it can do so in alcohol or spirit. On the manufacture of perfumery consult Perry's Treatise on Making Perfumery.

The otto or essential oil or extract is sometimes obtained from the wood, *e.g.* cedar, sandal wood, eucalyptus: from the flowers, *e.g.* rose, jasamine, champa, *maulsari;* from leaves, *e.g.* peppermint, thyme patchouly; from roots, *e. g.* rushes, valerian; (*Kuth,*) iris; from seeds, *e.g.* anise, caraway, dill seed; from bark *e.g.* cajeput, cinnamon. The orange flowers give no less than three distinct perfumes, *petit grain* from leaves; *neroli* from flowers; *Portugal* or *essential oil of orange* from the rind of the fruit. So too the lemon. Some grasses also yield very rich perfumes; *e.g.* the lemon grass.

The seeds, the bark, the rind, or the crushed wood should invariably be soaked in water for about 12 hours before the otto is extracted. The otto from the lemon or orange rind can, however, be extracted by means of expression *i.e.*, by squeezing the rinds

with some such machine as used for manufacturing vermicelli. In the case of several flowers, maceration may be employed, *i.e.*, the flowers should be placed in contact with purified fat, olive oil or sweet oil which has the property of absorbing the otto within 12 to 18 hours. Thus it is that in India jasamine oil is prepared by spreading flowers on sesame seeds—this however, results in wastage of perfume. The spent up flowers are thrown away and the process repeated till the required strength of perfume is obtained.

Alcohol.—The alcohol used in the manufacture of lavenders, extracts etc., should be pure *i.e.*, free from foreign flavour. Alcohol can be deodorised by distillation over potassium permagnate or over hard soda soap, free from excess of fatty acids. Common washing soap with a little soda will answer the purpose.

It is always best to use Grape Spirit or Perfume Spirit. Rectified spirit being much too coarse should not be used.

On account of the high duty levied by the Government, rectified spirit and alcohol have of late become much too dear for the preparation of any but the very high grade lavenders and perfumes. The manufacturers in the West now use another new spirit called Iso-prophyl alcohol in the manufacture of Brilliantine and other Hair Preparations. Isoprophyl costs less than half the rectified spirit. For still cheaper articles Industrial Methylated Spirit is used. This is a crude rectified spirit. It must not be confused with the so-called Methylated Spirit which strictly speaking is Mineralised Spirit and on account of its disagreeable smell is totally unfit for any toilet preparations.

Solubility of Essential Oils.—Rectified spirit readily dissolves essential or volatile oils like Lavender, Bergamot, Rose, etc., and odour substances like musk, vanillin, heliotropin etc. If much water be added, the essential oils are again thrown out. This is why the alcohol taken must always be above 75 or 80%. All lavenders and perfumes made with rectified spirit or alcohol improve with age. They should invariably be stored in well-stopped bottles or decanters.

The Yield of Otto.—From 100 lb. of the thing is as follows:—Orange peel, 10 oz.; *niazbo* (marjoram) dry, 15; *niazbo* fresh, 3; peppermint dry, 16; peppermint fresh 3 to 4; dill seed, 4 to 7; aniseed, 36 to 48 oz.; caraway, 64; cloves, 250 oz.; cinnamon, 12; *tejpat* (cassia), 12.; cedar (*cheel, deodar*) wood, 14; *jawatri* (mace), 140; nutmegs (*jaiphal*), 150 to 200 oz.; bitter almond cake, 7; geranium leaves, $1\frac{3}{4}$; *henna* (myrtle) leaves, $4\frac{1}{2}$; lavender flower, 28; patchouly herb 25; sandalwood, 27; rhodium wood, 3; violets, about $\frac{1}{16}$ oz.; rose, $1\frac{1}{2}$; *khuskhas* (vitivert) 1/16.

Compound Essences.—The otto makers of Jaunpur, Kanauj. Mirzapure and elsewhere have since times immemorial been mixing different *attars* to make perfumes, but their horizon has been limited by the Indian perfumes only. The perfumers in the West have ransacked the whole world and now they manufacture hundreds of perfumes by admixtures. They mix many substances which by themselves were never classed as fashionable perfumes *e.g.*, oil of cloves, oil of mace, and oil of cinnamon. The compound essences as given below improve with age, one month being the least. To avoid locking up the capital in alcohol, mix up the perfumes alone, and add alcohol a month or two before packing; on the other hand, where a perfumer does not hold the license, it will be always safe for him to perfume the alcohol purchased so as to be free from search warrants.

Generally speaking, 1 oz. of essential oil of any flower may be added to 16 oz. of rectified spirit or absolute alcohol.

ESSENCES, LAVENDERS, AND LIGHT PERFUMES.

See also Chapter IV

Lavender Essences etc.—(*a*) *Essences of Lavendar.*—Essential oil of lavender, 7 oz.; rectified spirit, 4 quarts; rose water, 1 pint; tincture of orris, 1 pint. (*b*) *Simple Spirit of Lavender.*—Lavender flowers (free from stalks), 1 seer; rectified spirit, 4 seers; water, 8 seers. Distil as much as the spirit. (*c*) *For barbers.*—Oil of lavender, 6; oil of bergamot, $3\frac{1}{2}$; essence of tonka beans (1 in 10), 2; rose water, 24; alcohol 160.

Sweet Pea.—Take equal parts of extract of tuberose, and orange flowers. Add one eighth part of tincture of vanilla.

Bridal Bouquet.—Cumarin, 5 gr.; otto of rose, 15 drops; essence of vanilla, 1 fl. oz.; essence of musk, 2 fl. oz.; essence of jasmin, 5 fl. oz.; tincture of benzoin, ½ fl. oz.

Carnation.—Carnation synthetic, 20 drops; oil of cloves, 10 drops; otto of rose, 30 drops; 1 oz. each of essences of jasmin, tuberose, and cassia; 1 fl. oz. each of vanila, civet, and benzoin; 80% alcohol, 11 oz.

Cherry Blossem.—Heliotropin, 30 gr.; aubepin, 2 gr.; cumarin, 2 gr.; otto of rose, 4 drops; essence of musk and essence of vanilla, 1 fl. oz. each; essence of jasmin, 2 fl. oz.; 90% alcohol, 16 fl. oz.

White Lilac.—Terpinol, 40 drops; oil of bergamot 30 drops, cumarin, 5 gr.; vanillin, 5 gr.; tincture of benzoin, 1 fl. oz.; 80 % alcohol to make 1 pint.

Lilly of the Valley.—White Lilly perfume, 15 fl. oz Oil of Linaloe, 10 drops; terpinol, 6 drops; oil of cloves, 1 drop; 1% alcohol, 5 fl. oz.

New Moon Hay.—Cumarin, 15 dr.; vanillin, 10 gr.; terpinol, 3 drops; essence of orris, 1 fl. oz.; oil of bergamot, 3 fl. dr.; oil of lemon, 1 fl. dr.; oil of rose geranium, 10 drops; 80% alcohol to make 1 pint.

Violet.—Ionone 30 drops; essence of orris, 4 fl. oz.; essence of musk, 4 fl. oz.; otto of rose, 10 drops; essence of jasmin, 6 fl. oz.; 80% alcohol to make 1 pint.

Sweet Briar.—Essence of musk, 1 fl. oz.; essence of tuberose, 1 fl. oz.; otto of rose, 10 drops; Eau de Cologne, 16 fl. oz.

Eau de Cologne, Cologne Water.—(*a*) Take 1 tola each of oil of lavender, oil of bergamot, oil of lemon, oil of neroli; ½ tola of oil of cinnamon; 15 tolas each of spirit of rosemary and spirit of balm (Eau de Carmes); rectified spirit, 120 tolas. Macerate for a night and distil over a water bath. (*b*) Oil of orange, 2.5; oil of lemon, 3.5; oil of bergamot, 1.5; oil of neroli, 1.5; oil of rosemary, 1.5; alcohol, 370. (*c*) Oil

of orange, 24 ; oil of lemon, 24 ; oil of bergamot, 1.5 ; oil of neroli, .5 ; oil of *khushkas* (vitivert), .5 ; oil of rosemary, .5 ; alcohol, 770.

Antiseptic Lavender.—To keep off tubercle germs, hold the handkerchief to the nose.—Eau de Cologne as prepared above, 8 oz. ; chloral hydrate, 2 dr. ; quinine, 10 gr. ; pure carbolic acid, 30 gr. ; oil of lavender, 20 mm.

Essence of Ambergis.—(*musk amber*) for clothes, handkerchiefs.—Spirit of rose, 3 ; tincture of ambergis, 8 ; tincture of musk, 4 ; tincture of vanilla, 1. A very lasting odour.

Cherry Blossom.—Essence of peach blossoms, 84, essence of violet, 14 ; essence of bitter almonds (1 in 9); 20.

Spirit of Cloves.—Add 20 drops of oil of cloves to 10 t. of alcohol.

Jockey Club.—Extract of jasamine, 5 ; extract of orris, 20 ; extract of musk, 7 ; extract of vanilla, $1\frac{1}{2}$; rose otto, $\frac{7}{32}$, otto of bergamot, $\frac{5}{32}$; superior oil of neroli, 1/12 ; benzoic acid. $\frac{1}{4}$; pure spirit to make 64 parts.

Essence of Lemon.—Oil of lemon, carbonate of magnesia, sugar, each 1 part ; alcohol. 16 ; water 16. Dissolve the oil in 4 parts of the alcohol, mix in the mortar with sugar and magnesia. Add slowly the remaining parts. Used also in medicines.

Extract of Musk.—Rub 1 part of musk with 4 parts of hot water. Let stand in a covered mortar for 2 hours when add 60 parts of alcohol. Cork tightly. Filter in about a month.

Orris Tincture.—Macerate powdered orris root in double as much alcohol for a week and filter.

Pine Extract.—For tuberculous patients ; oil of pina picea, 8 ; oil of lavender, 1 ; oil of bergamot ; 1 oil of lemon, 1.

Lavender Water.—Oil of lavender, 4 dr. ; oil of bergamot, 20 drops ; oil of lemon, 20 drops ; oil of rose 10 drops ; rectified spirit to make 2 pints.

Ylang Ylang.—Oil of ylang ylang, 40 drops ; otto rose, 20 drops ; oil of neroli, 15 drops ; oil of bergamot 15 drops ; essence of musk 2 fl. oz ; essence of vanilla,

1 fl. oz.; essence of jasmin, 4 fl. oz ; essence of tuberose, 2 fl. oz. ; 80% alcohol to make 20 fl. oz.

Ylang Ylang.—(1) Extract Jasmine, 8; extract roses, 16; tincture orris root, 8; tincture civet, 4; oil of ylang-ylang, 4 dr.; alcohol, 40 oz. (2) Tincture tonka beans, 3; tincture musk, 4; extract tuberose 4; extract cassia, 4; tincture orris root, 8; fresh oil of orange peel, 1/4; neroli, 1/16; alcohol to make 80 parts.

Orris Tincture.—Orris root powder, 2; alcohol, 4. Soak the powder in alcohol for 7 days. Filter. Percolate. Make 4 parts with more of alcohol.

Patchouli.—Otto patchouli, 2 dr.; otto roses, 20 mm.; alcohol 15 oz.

Rose water.—Rub Otto roses, 25 mm. with 1 oz. of white sugar powder; and 4 dr. of carbonate of magnesia. Add slowly ½ gallon rainwater or distilled water and 4 oz. of perfumed spirits.

Vitivert Essence.—Vitivert root cut small, 2 lb. Immerse in water enough to moisten it for a day. Crush in a marble mortar. Macerate in enough alcohol to cover it for about 10 days in wide stoppered jar. Strain with pressure. Filter through blotting paper. Again, filter a fortnight later.

Heliotrope.—Essence of orange flower, 1; spirits of roses, 1; vitivert spirit; 2; tincture vanilla, 1; tincture of orris root, 2; tincture of tonka beans, 1; spirits of orange flower, 1; tincture ambergis, ½; otto sandalwood, 10 mm. oil of cloves, 4 mm. Mix well.

Ladies' own Lavender.—Rectified spirits, 6 bottles; otto roses, 20 mm.; essence of thyme, ½ oz.; essence neroli, ¼ oz.; essence vanilla, ½ oz.; essence bergamot, ¼ oz.; orange flower water, 6 oz.

Jockey Club.—Rectified spirits, 5; orange flower water, 1; balsam of peru, 1/32, essence bergamot; 1/16; essence musk, 1/16; essence cloves, 1312; essence neroli, 1/64. The mixture resembles the previous to a great extent but the odour is of course different.

Violet Extract.—Essence violet, 32; cassia essence, 6; rose essence, 3; tincture orris, 8; tincture ambergis, 2; tincture civet, 2; spirit of almonds, 20 mm.

SYNTHETIC SCENT COMPOUNDS

Lilac.—Terpeneol, Heliotropen etc.

Violet.—Ionone, Irisom, Viodoron, Irisoil, Iris Resinoid, etc.

May Flower.—Linalool, Terpeneol, etc.

Sandalwood.—Santalresiniod, geraniol, Phenylethylalcohol.

Jasmine.—Benzylacetate, Indol, Lenalylacetale, etc.

Almonds.—Benzoldehyde, etc.

Orange.—Yara Yara (Betanapthol methylether.)

Bromelia.—(Betanpatholethylether), etc.

Rose.—Geraniol, Rhodinol, Geramilacetate, Hydroxicetranellal (aldehyde), dınalool, Citronellol, alcohol Phenilethylalcohol, Reunionl, etc.

Geranium.—Dephenylenethane, Diphenylether, etc.

Trefle.—Amylasalicylate, Heliatropan, etc.

Gold Lack.—Iris Resiniond, Neroline, etc.

Hay.—Cumarine (Lactone), Liquid storax (gum storax) etc.

Musk.—Musk Xylol, Musk ambrette, Benzyl benzoate, etc.

SOLID PERFUMES

Fumigating Pastilles.—Cascarilla, 1 oz.; benzoin, 1 oz.; camphor, 1 dr.; saltpetre, 1 dr.; charcoal, 2 oz.; ambergis, 1 gr.; musk, 1 gr. Reduce to a fine powder. Make into a stiff paste with gum arabic or gum tragacanth mucilage. Cut into cones or pencils. Let dry.

Scent Powder for Clothes.—Corıander, 1; orrıs root, 1; rose leaves 1; calamus, 1; lavender flowers, 2; rhodium wood, 1/32; musk, 1/96. Powder coarsely.

Solid Perfumes or Pomades.—Solid perfume is nothing but hard paraffin mixed with the required odour. The paraffin is melted over a water bath or slow fire so as not to become black and the perfume mixed. For the moulds, small tin boxes are used :—

(*a*) Oil of corıander, 18 drops; oil of cloves, 2 drams; oil of nutmeg, 1 dr.; oil of lavender, 3 dr. sandal

wood oil, 1 dr.; oil of bergamot, 1 oz.; rose otto, ½ dr.; oil of geranium, ½ dr.; oil of orange, 10 drops. Mix and add to the paraffin as described above. (*b*) *White rose solid perfume.* Oil of geranium, ½ dr.; oil of bergamot, ½ dr.; oil of patchouli, 5 drops. (c) Any other Indian otto, *e.g. henna*, rose amber, *motia*, jasamine, *keora*, etc., may be used. The quantity to be taken will very according to the strength required. Solid perfume is known in India as *Fitna.*

German Pomade for Strengthening the Hair.—Take 8 oz.; of purified marrow, melt it in a glass or stoneware vessel, and add 1½ oz. of fresh bay leaves; 1 oz. of orange leaves; 1 oz. of bitter almond; ½ oz. of nutmegs; ½ oz. of cloves, and 1 drachm of vanilla, all bruised; cover the vessel and let the whole digest for 24 hours, with a gentle heat; strain while warm through linen and stir it as it cools.

A Dainty Pot-Pourri.—Any kind of scented flower may be used, and the best result is obtained from a mixture of them including lavender, meadow-sweet. rose petals, jasmine, and hay leaves. A minute preparation of deised scented herbs may be added, if liked.

The flower petals must be gathered while dry, on a dry day, sprinkled with common salt, and the whole mixed with cloves, raspings of sandalwood, and grated orris-root. No one scent should predominate. If all the flowers chosen are not procurable at the same time, some of them can be added later after being mixed with salt.

The flowers—except the lavender—do not require any pecial drying and the pot-pourri must not be packed tightly into the vessel which contains it.

A pot pourri is a potted perfume of dried petals and spices kept in a jar for its perfume.

Potted Perfume.—It is a pleasure to enter a room which, all the year round, has a delightful and refreshing fragrance of flowers. That can be easily accomplished, and for town dwellers—the material can be gathered during March and April.

Get a good quantity of fresh rose leaves and dry them in the sun for some days. Add cherry-pie petals lavender ears, verbene, sweet peas, or any other scented

flowers. They should be picked early in the morning, after fine day, and, if possible, just before they are in full bloom. Dry very thoroughly. Powder an ounce of cloves, orris root, and cinnamon, add a tablespoonful of bay-salt and spread this mixture over the dried petals. Then sprinkle ten drops of oil of lavendar and cloves, five of cinnamon, and a little oil of musk. Mix thorughly. Then place in an ornamental jar. Stir occasionally. The most delightful aroma will be given out, and it will last for years.

HAIR OILS.

Hair Oils.—The bases for the hair oils are sesame oil, cocoanut oil, karwa oil, petroleum oil purified and deodorised, liquid paraffin (too sticky). Also Atolaine, Olive oil, Almond oil, Oil of Peach-kernel, surplus oil given off during the manufacture of soap, otherwise called *kunda* oil. Petroleum and *kunda* oils are worse than useless for the growth of the hair and for keeping the head cool.

For perfuming, different kinds of odours manufactured by Heiko and Co. of France, Schimmel and Co. of Germany, are mixed in varying proportions. The latter company supplies pamphlets on the manufacture of these hair oils to its customers free of charge. The perfumes may be ordered for through any respectable importer of Delhi, Lahore, Bombay, Calcutta, etc.

Pure jasmine oil is prepared by spreading layer of flowers on sesame seeds for a whole day; then throwing off the flowers, and repeating the process as many times as the strength of the oil is required. The same may be done in the case of other flowers. The seeds can then be crushed in an oil mill, and the oil pressed out.

Few perfumers prepare pure *Amla Oil*. What they do is to prepare what is generally known as the *masala* oil, and colour it green. The masala oil is prepared by soaking *hayoober*, *kapoor*, *kachri*, *nagar motha*, *balchhar*, *nakhun parian*, all properly crushed, in sufficient water, and boiling together the whole mass with required amount of sweet oil, taking care that the oil is not too much heated lest it should take fire or the whole of the perfume may be evaporated. Fire should be, therefore, slow. Boil as long as the whole of the

water has not been evaporated. Clean the liquid, and colour as desired.

The use of *karwa* or rapeseed oil in making hair oils is to be deprecated. It contains too much of fixed acid essential oil and so the greater portion of the perfumes mixed is wasted in masking the odour. Again this oil is much thicker than sweet oil or cocoanut oil. This produces the knotting of the hair on the head much more quickly and so one has to wash the hair oftener than would be the case with hair oils having other lighter bases as cocoanut oil or gingely oil. Deodorised cocoanut oil is the best base for all hair oils as of all others it promotes the growth of hair and prevents dandruff.

Colours for Hair Oils.—*Green*—Chlorophyl. *Yellow and Brown.*—Fat soluble Aniline Dye. *Red.*—Alkanet root digested on a water bath and filtered. Fat soluble Aniline Dye.

Perfumes for Cheap Hair Oils.—1. Oil of lemon, 1 fl. oz.; oil of rose geranium, $\frac{1}{4}$ fl. oz.; oil of linaloe, $\frac{1}{4}$ fl. oz.; terpinol, 10 drops.

2. 1 gram each of heliotropin, vanillin, and cumarin; 5 drops each of oil of cloves, oil of lavender and oil of verbena. 1 fl. oz. of oil of bergamot.

Add the above to any base.

Orange Oil.—Prepared by mixing 1 oz. of extract of orange to every bottle of sweet oil; lemon oil by mixing an equal quantity of citronella; and karna oil by mixing the extract of citron (*khatta*) flowers.

To colour red use alkanet root (*rattanjot*). For green colour, chlorophyl; for brown, caramel.

Crystalline Cocoanut Oil.—(*a*) Castor oil, 3; cocoanut oil, 4; alcohol, 7; oil of lavender, $\frac{1}{8}$; oil of bergamot, 1/16; oil of geranium, 1/48. In winter, melt the cocoanut oil. Dissolve castor oil in alcohol. Incorporate both thoroughly. Finally add perfume; colour to suit.

Oils to Keep the Hair Black.—(*a*) Put 100 flies in a bottle of sweet oil and keep in the sun for full 40 days. Strain and purify. (*b*) Boil one part of cypress leaves and 2 parts of myrobolans in enough of water. When soft, add sesame oil. Take off the fire as the

water is evaporated. Strain and bottle. Perfume if desired. (*c*) Boil juice of bhangra with sweet oil. Prepare as (*b*). *Bhangra* is known as *bhakkra, hashtshingar.* It grows abundantly in wild places with prickly nodules and is abundantly found in India. (*d*) *Friend to the hair*—Melt 5 oz. of refined wax over a water bath ; add 2 lb. of almond oil, 1 lb. of poppyseed oil. Incorporate all these thoroughly. Let cool a little, and mix oil of bergamot, 1 oz. ; citronella, ½ oz.; otto of lavender, 2 dr. ; oil of cloves, 1 dr.

Macassar Oil.—(1) True macassar oil is obtained by boiling the kernel of a Malayan tree, badean, resembling walnuts. Factitious macassar oil may be made by mixing 1 dr. of oil of origanum, 1 dr. of oil of rosemary, with 1 lb. of sweet oil.

(2) Olive oil, 2 pts.; alcohol, 2 oz. Put 1 oz. of alkanet root tied in a muslin bag into the oil. Let stand for a few days. When all becomes red, remove the bag. Do not press it.

Castor Oil Glycerine.—Melt 3 parts of white wax over a water bath. Incorporate 6 parts of castor oil, and then 18 parts more, and 4 of glycerine. Let cool. Add oil of lemon, ½ part; oil of bergamot, ¼; oil of lavender, ⅛; oil of cloves, 1/48. Colour as desired.

SYNTHETIC BLENDS OF PERFUMES FOR HAIR OILS.

There are no vernacular names for these synthetic perfumes. All of them are recently blended products.

1. **Jasmine Hair oil Compound.**—Benzyl Acetate, 40 ; benzyl butirate, 5 ; hydroxicitronell, 8 ; amyl cinami aldehyde, 10 ; Mowsee de chive, 6 ; Linolol, 5. ; Terpenol, 5 ; Linanyl acetate, 5 ; cederwood oil, 3 ; civet tincture, 2 ; cinnamicalcohol, 3 ; tube-rose synthetic 2 ; nerolisythetic, 3.—*After Sen Gupta.*

2. **Narcissus (Nargas)** Blende—: Paracresyl phenyl acetate, 40, styrolyt valerionate, 75 ; phenyl propyl aldehyde, 10 ; benzyl acetate, 60 ; terpinol, 65 ; jasmine synthetic extra, 275 ; rose synthetic extra, 100 ; methyl anthramilate, 45 ; musk ambrete, 40 ; rose femelle oil, 165 ; peru balasam, 100 ; phenyl acetic aldehyde, 25.

3. **Rose type.**—Rhodinol, 50; citronellol, 20; phenylethyl alcohol, 30; geranyl formiate, 3; linalol, 15, patchouli 2; geranium African, 10.

4. **Kewra Synthetic.**—Kewra oil, terpeneless, 20; kewra oil absolute, 80; benzyl benzoate, 350; phenyl ethyl alcohol, 70; nonyl aldehyde, 50%, 10; ylang-ylang, 10; tuberose, 10; kewra resinoid, 20; cinnamic-alcohol, 7; terpenol, 150; benzyl floracetate, 13; ethyl vanilin, 5; di-methyl benzyl carbinyl acetate, 50; orrisabsolute 10%, 25—*Hindustan.*

5. **Jawakusam-like blend.**—Bela oil of Jaunpur, 12; refined white till seed oil, 6; Mysore sandalwood oil, 23; French Lavendar 52%, 13; bergamot, 1; lemon oil, 1. Colour with alkanet root.

N.B.—Blends like the above can pay only the professional perfumers who can buy pound bottles of the constituent synthetic perfumes direct from Holland, France, or Germany. The field is not limited. In the hills there grow at different altitudes different kinds of sweetly scented grasses and flowers which waste their fragrance in the wilderness. If perfumes be extracted and turned into different blends, they can amply pay any enterprising young man who has a perfumer's nose and can detect in a given blend all or most of the combining perfumes. Here is a fallow field to cultivate; a field to make money.

DISTILLING FRAGRANCE FROM FLOWERS.

In an ideal perfume the basic qualities are always the same. A famous *parfumier* summed them up as delicacy, "life" and perfect aroma.

Many of the perfumes sold in expensive cut-glass bottles do not come up to this test. Their delicacy may degenerate into thinness—there is a difference. They may be fragrant as the flowers from which they are distilled, but fail to give the fragrance for any length of time. And what is more distasteful than a stale perfume?

Some of the most exquisite scents in the world come from France. And the sweetest of all come from the old Riviera town of Grasse, in the verdant hills above Cannes. There for centuries they have studied the magic art of extracting from the native roses,

violets, mignonettes, jasmine, and orange-blossom, the delicious perfumes which ravish the human senses.

In spring most of the flower harvest is in, and the process of extracting the perfume and distilling it into rare essence, highly concentrated, to form the basis of perfumes, is in full swing.

Steam is used to distill the fragrance, but there is also the more prolonged and old-fashioned method of *enfleurage* by means of beef fat. The petals are laid on the cold fat in shallow trays. The flowers lie there for many days—some for two months—renewed and renewed again, until the fat is impregnated with the perfume of the flowers which is finally distilled out.

Few of the perfumes used in soaps, bath salts and other toilet articles owe anything to the sun-kissed gardens of Grasse. They come from the laboratories; they are synthetic aromas secured from chemicals, and they are as like to the real flower perfume as a stone is to a cut and polished diamond. The prices of the best flower perfumes are high in these days; but in perfumes, as in art, only the best is worth while.

CHAPTER XVII.
OFFICE APPLIANCES.

WRITINGS INKS.

Blue-black.—(*a*) Boil 42 parts of gallnuts in 120 parts of water. Mix ½ part of Indigo solution (indigo sulphonic acid). Add 5.5 parts of green vitriol, and 2 of metallic iron dissolved in crude acetic acid (pyroligneous liquor). Add 1/50th part of the whole lot phenol. (*b*) 3 parts of gallnuts, 1 of green vitriol, 1 of logwood extract (1 part of logwood boiled in 50 of water). Add 1/40th part of the whole gum arabic. (c) Nut galls free from holes crushed, 9; crushed cloves, 1/4th; cold water, 80; crystals of green vitriol, 3; sulphuric acid, 70 mm.; sulphate of indigo, ½. Soak the first two in water for a fortnight. Add remaining constituents, the indigo in a paste. Set aside for 7 days. Filter. (*d*) Boil 15 parts of gallnuts powder in good quantity of water (all the water being 400 parts). Dissolve 5 parts of green vitriol in the remaining water and ½ part of indigo in 5 parts of strong sulphuric acid.

Mix all and strain after a few days. (*e*) *Permanent Blue-black*. Powder of gallnuts, 3; green vitriol; 1; gum arabic, 1; vinegar, 1; water, 18; indigo carmine sufficient to give a blue tint. Shake well and soak for a fortnight. Decant.

Ink from fermented Gall Extract.—Keep moist 200 parts of powdered Chinese galls (but not wet). at 20° C—25° C, until they get mouldy in about a week. Most of the gallotannic acid will then have fermented into gallic acid. Extract the galls completely with hot water; add talc; filter the solution and make up 1,000 parts by weight, add 100 parts of (10 per cent strength) of ferric chloride solution. Let alone for a fortnight in a closed vessel, when decant, and add 3 parts of phenol blue in 400 parts of water and 1 part phenol in ink solution. Again let alone for a week in covered vessel, when decant. You will get blue-black ink. If at the end of a fortnight instead of phenol blue, 10·5 parts of aniline green and 9 parts of ponceaured *R*; 1 part of phenol blue 3F. be dissolved you will get black ink.

Blue-black Ink.—Immerse good aleppo galls (*maju*) crushed in a stone mortar (*kharal* or *kundi*), 8 oz.; curshed cloves, ½ oz. in 4 pints of water for a week. Agitate from time to time. Strain. Press through a non-iron press-filter. Add ferrous sulphate, 3 oz.; neutral indigo carmine powder, 80 gr. Now keep the solution for at least a month before it can be ready for use. Shake from time to time. This gives a permanent ink for state documents and unlike the one made with logwood extract does not fade easily. Should it fade, it can be revived easily by proper treatment.

The Official German Standard Ink.—Tannic acid, 23-4 parts; gallic acid, 7.7 parts; ferrous sulphate, 30 parts; gum arabic, 10 parts; dilute hydrochloric acid (10%), 25 parts; phenol, 1 part; water to make 1,000 parts. Addition of two parts of phenol blue makes it a ne plus ultra ink.

Blue.—Tannic acid, 20; gallic acid, 5; green vitriol, 48; neutral indigo, carmine, 82; cloves powder, 1/20; water, 768. Dissolve acids in water to which

add green vitriol. Filter through cotton flakes. Add indigo carmine and lastly cloves.

Reade's Patent Blue Ink.—Prepare a solution of iodide from iodine iron and water; add to the solution half as much iodine as first used. Pour the solution into a small semi-saturated solution of ferro-prussiate of potash, containing nearly as much of the salt as the whole weight of the iodine. Collect the precipitate; wash it and finally dissolve it in water to form the ink. The solution from which the precipitate is separated is evaporated to dryness and the residue redissolved and crystallized, yields pure iodide of potassium. (c) Powder mango stones in an iron kettle with a little green vitriol. Let cool and strain. Add a little indigo carmine.

Black Ink.—(*a*) Gall nuts, 11; sulphate of iron, 2; indigo solution, 1/7; water, 33. Prepare as above (*b*) *Acid resisting Black*. To (*a*), add a strong solution of Prussian Blue in water. (*c*) *Harars* 1; *baheras*, 1; myrobolans, 4; geen vitriol, 1. Crush and boil in 100 parts of water. Strain, add a litle indigo carmine. (*d*) For a gallon, take 1 lb. of gall-nuts, bruised; 9 oz. of green vitriol; 6 oz. gum arabic; 1 gallon of water. Boil the galls and let settle. Decant. Add remaining and stir well. (*e*) Make a solution of nuts gall as above. Add vanadate of ammonia. (*f*) *Japan Black*. Calcine green vitriol, *i.e.*, take white powder of the same. Add gum and a little sugar. Make a solution.

Red Inks. (*a*) Dissolve 15 to 20 gr. of good carmine in 30 oz. of water. Add strong liquid ammonia drop by drop till the whole is dissolved. Add 20 gr. of gum arabic powder. (*b*) Boil best ground Brazil-wood, 4 oz. with 1 part of dilute acetic acid and ½ oz. of alum, in an enamelled saucepan or covered copper vessel for an hour. Strain. Add ¾ oz. gum. It is always safe to macerate the brazilwood for 2 or 3 days.

Green Ink.—Boil together cupric acetate, 4 dr.; pot. carbonate, 2 dr.; distilled water, 16 fl. dr., until reaction is complete and with the addition of more distilled or rain water make up 2 fl. oz.

Blue.—Dissolve Prussian Blue, 3 dr.; oxalic acid, 1 dr. in 4 fl. oz. of distilled or rain water and add 40 gr. of gum arabic.

Gold Ink.—Beat gold leaf to a smooth paste with glycerine. Boil with water and let the gold settle. Pour off the diluted glycerine. Wash once with water. Mix the finely divided gold with mucilage and a trace of water glass. For polishing use some smooth ivory instrument.

Silver Ink..—Same as above but use silver leaves.

Ink Powder.—Extract of logwood, 1; potassium bichromate. 1/10; sodium carbonate, 1/32. By the addition of a little more gum and a little water, the ink may be turned into dough and then with a machine into tablets.

Black Ink Powder.—(*a*) Blue vitriol, 2; gum arabic, 4; green vitriol, 16; gallnuts, 64; extract of logwood, 64. Powder and mix well. (*b*) Dry extract of logwood, 400; bichromate of potash 4. Pulverise and incorporate well.

Ink Tablets.—To any of the above inks when in the form of a dry powder, add gum arabic and a little water, and treat as the following. The tablet gives the desired lustre.

Ink Tablets.—Good quality of ink tablets may be obtained by the following recipe:

Nut-galls	2 oz.
Ferrous sulphate ..	5 gr.
Copper sulphate ..	15 gr.
Alum	1 gr.
Sugar candy ..	90 gr.
Gum arabic ..	$2\frac{1}{2}$ gr.
Cream of tartar ..	15 gr.

Make into a stiff paste with water. Mould and dry.

Ink Tablets for Travellers.—Make a strong solution with a little gum arabic of any aniline dye. Saturate three or four sheets of blotting paper with the ink and press them together to form a pad. When dry cut them by means of a punch in the form of tablets.

Indian Ink.—(*a*) Finest lampblack is mixed with a solution of 100 gr. of seed lac with 20 gr. of borax, and 4 oz. of water. (*b*) Grind finest lampblack with gum arabic. Spread the thick paste so formed on corrugated sheets of iron or of slender reed work to dry in the sun. Cheap quality ink is obtained by using charcoal of almond shells finely ground instead of lampblack. The last itself is sufficiently cheap.

India Ink.*—Work fine lamp black with solution of caustic soda, Dry. Mix a few drops of synthetic musk with a solution of gelatine—a weak solution—mix with the purified lamp-black and turn into a thick paste. If desired instead of gelatine the following solution may be used, seed lac, 2 oz.; borox, $\frac{1}{2}$ oz.; water 2 pints; boil to an intimately mixed solution. Add water to bring about the desired consistency.

2. Rub up 2 parts of lamp black; 16 parts of water; 1 part of powdered indigo. Evaporate greater portion of water by boiling; add $1\frac{1}{4}$ parts of gum arabic, $\frac{1}{2}$ part of bone-glue; $\frac{1}{4}$ part of extrct of succory. Boil to a thick paste. Grease wooden moulds with olive or almond oil and pour the paste into the moulds.

To obtain a finer quality of ink, burnt kernels of peach or burnt shavigs of cork from bottle merchants may be used. Gum arabic used in the place of glue gives greater gloss to the ink.

The màss thus produced should be pressed into flat cakes, each weighing about a pound, and left to ripen for a few days. The dough can be made plastic by warming over live charcoal in a basin or stove. When it has been sufficiently kneaded it can be pressed into moulds and cut into cakes of the desired size just as soap cakes. The moulds should be made of wood. To produce lustre beat the ink with a brush saturated with rosin. This process also saves the hands from being blackened later on.

If desired instead of musk, some camphor may be used. In the West, India ink is used for shadowing drawings Good India Ink should present smooth, glossy fracture when broken; should have no gritiness

*India inks are used for reed pens; better qualities for drawing

when rubbed against the front teeth : and the fractured parts should again unite when wetted with saliva.

3. Ordinary Indian Ink used for Urdu script is made by triturating fine lamp-black with a solution of gum arabic, and reducing it to a fine paste, when it is sprinkled over reed-work, called *sirkies*. As it is dried in the sun, small flakes peel off. This composition can be varied by mixing some of the ingredients given in the foregoing formulas.

Cyclostyle or Duplicator Ink.—Copaiba, 2; lamp-black, 3; indigo, 5/8; Prussian blue, 5/8; Indian red, 3/4; yellow soap, dried and powdered, 2 to 3. Mix well with a little water. (*b*) Grind aniline colour with glycerine, diluting with spirit if necessary. Add a few drops of oil of cloves.

Cyclostyle Ink.—Any aniline colour may be ground with glycerine and thinned with spirit. Add a few drops of oil of cloves as preservative.

Mimeograph Ink. *Ingiadients*: Shellac, 2; borax, 2; water, 24; colour, sufficient. *Process*: Boil ingredients till intimately mixed by stirring. Add some gum acacia. Dissolve. Take off from fire. When cold add more colouring matter to suit and more water to make altogether 24 parts.

Ink for Duplicators.—*Blue*. Resorcin in Blue M. 10; dilute acetic acid, 1; water, 85; glycerine, 4; alcohol, 10. *Red*. Fuchsine, 10; alcohol, 10; glycerine, 10; water, 50. For *Violet*, substiute methyl violet.

VARIOUS INKS AND WRITING ACCESSORIES.

Rubber-stamp Ink, Violet.—Take methyl or aniline violet, 3 dr.; distilled or rain water, 10; acetic acid, 2 dr.; alcohol or methylated spirit, 1½ oz. glycerine enough to make 10 oz. Mix well in a stone or glass mortar. To produce other colours, substitute the desired aniline colour.

Rubber Stamp Pad.—Take gelatine, 1; water, 1; glycerine, 6; colouring matter—any aniline colour—6. Swell the gelatine with cold water; boil; add glycerine ground with colour. Pour in a shallow box and cover with a thin cloth. The surface of the cloth should be scraped off occasionally. When the colour is nearly

used up, the *Rubber Stamp Ink*, as indicated in the previous paragraph should be added.

Metal Stamp Ink.—Stamping inks designed for metal stamp inks are best prepared with oil, those for rubber with glycerine :—*Blue* : Ultramarine, 26 grams ; olive oil, 75 grams. Mix them intimately with the aid of slab and muller. (Olive oil is *zaitoon ka tel*). *Brass Stamp Ink*: (*a*) Ordinary printer's ink thinned with olive oil. (*b*) *Green* : Copper acetate, 25 grams ; oleic acid, 5 grams ; olive oil, 70 grams. Mix as in Blue. (*c*) *Red* : Cinnabar, 40 grams ; olive oil, 60, grams ; mix as above. *Steel Stamp Inks:* Copiaba 9 oz. ; lamp black, 8 oz. ; indigo, 5 grams ; Prussian blue, 6 drams ; Indian red $\frac{3}{4}$ oz. ; dried yellow soap, 3 oz. Grind to a uniform smoothness.

Another Process.—(1) *Black:* Aniline black, 5 parts ; oleic acid, 6 parts ; castor oil, 94 parts.

(2) *Red* : Bordeaux red, 15 parts ; Aniline scarlet, 15 parts ; crude oleic acid, 50 parts ; castor oil, 950 parts.

In preparing these inks rub the aniline (oil soluble) to perfect smoothness in oleic acid ; then triturate the oil, little by little, after the whole of the oil has been rubbed in, heat the mixture under constant stirring, to about 167 deg. F.

Copying Ink.—For general purposes put a little sugar into ordinary ink.

Black. Heat in a China dish 1 oz. of extract of log-wood with 2 dr. of crystals of carbonate of soda with 8 oz. of distilled water till a deep red colour is obtained. Take off the fire. Stir in 1 oz. of glycerine (Sp. gr. 125) together with 15 gr. of chromate of potash dissolved in a little water. Also mucilage of 2 dr. gum arabic.

Blue. Add to 20 parts of sulphuric acid 5 of indigo and then 100 of juice of myrobolans, and 10.5 parts of iron filings. Stir well. Add 105 parts of gum arabic, 705 of sugar, 10·5 of sulphuric acid 66° B ; 105 of aniline blue ; 0.5 of carbolic acid, and 1,000 of myrobolan juice.

Blue-Black Copying Ink.—Ordinary Violet Copying Ink thickens quickly, but the following Blue-black

copying ink has several advantages. It keeps fluid for a long time. It is more or less yellowish red in colour while fluid; becomes blue on writing and gets blue-black on drying. It copies easily and perfectly. Take logwood extract of 10 degrees Beaume (*i. e.* of Specific gravity 1.075). Add to it one per cent. alum, and then sufficient lime water to form a permanent precipitate. Add dilute solution of bleaching powder just enough to impart blue-black colour; then drop by drop dilute hydrochloric acid till a distinct red colour has been produced. In this respect the log-wood extract behaves like litmus solution. Add 1 to ½ per cent. of glycerine and a little of gum arabic. Avoid excess of hydrochloric acid as of calcium chloride or bleaching powder.

Other Copying Ink.—*Red.* Dissolve 1 oz. of magenta in 60 oz. of water, and add 1 fluid oz. of glycerine or 20 drams of gum arabic. *Violet*—Dissolve 1 oz. of methyl violet in 32 oz. of water, and add 1 oz. of glycerine or 20 drams of gum arabic.

Addition of a few drops of creosote will keep them for a long time.

The best copying ink is made by adding a little alum to extract of logwood; and then incorporating with the mass a litle of table-salt or sugar and glycerine. This ink has a violet tint and darkens slowly.

Black Copying Ink.—1 Place 8 oz. of distilled or rain water in a porcelain cup or china dish. Add 1 oz. of extract of logwood and 2 drams of carbonate of soda crystals. Dissolve the extract to a red colour by heating. Take off the fire. Stir in 1 oz. of glycerine, and 15 grains of neutral chromate of potash, dissolved in a little hot water. This ink will give clear copies even without the help of a copying press.

2. A copying ink which will give two three copies with hand pressure may be made by mixing 1 pint of glycerine with 3 pints of jet-black writing ink.

Drawing Ink.—Make a saturated solution of borax in water; dissolve shellac in it and then rub up with good India Ink. Very black and indelible. After use the pen should be dipped in alcohol and wiped off.

Making Inks for Bags.—Dissolve in 1,000 parts of methylated spirit, 250 of rosin and 1,000 of shellac, with moderate heat, in a closed bottle for 12 hours. The bottle should be placed in hot water to which more hot water should be added to keep up the temperature. Shake well and stir in 200 parts of good black ink or any other ink.

Stencil Ink for Boxes etc.—Mix lamp-black, fine clay and gum arabic with water. Incorporate thoroughly in a mortar. The clay serves as a body and the gum as adhesive. Addition of a few drops of vinegar or acetic acid will help in mixing the ingredients. Dextrine or gum tragacanth may be used as adhesive.

Marking Inks.—To get jet-black colour, dissolve one dram of silver nitrate in a little water ; add ammonia by means of a pipette until the white precipitate first formed is again dissolved. Add a little indigo extract or sap green. Add strong gum water to make 1 oz. Write with a quill pen.

Indelible Marking Ink.—Make saturated solution of cuprous chloride. Add caustic alkali little by little until the whole of the cuprous chloride has been precipitated. Let settle. Pour out supernatant liquid, and with the precipitate mix the smallest uantity of ammonia that can be wholly absorbed. Incorporate about 6 per cent of dextrine.

Marking Ink for Bales.—Incorporate well 8 oz. of pure asphaltum : 9 oz. of venice turpentine ; 2 oz. of lamp-black ; and 2 quarts of oil of turpentine.

Stencil Ink for Fabrics.—The following ink will resist the action of water. Heat in a vessel 2 lb. of water and 4 oz. of shellac, till the shellac turns soft ; when stir in 2 oz. of powdered borax. Strain through a fine muslin cloth. In another vessel, containing 2 oz. of thick gum mucilage, stir in fine powders of $\frac{1}{4}$ oz. of lamp-black and $\frac{1}{4}$ oz. of prussian blue. Triturate to a fine paste, and thin with the shellac solution previously made. Let stand for a few hours when it will be quite ready for use.

Ruling Ink.—*Black.* Black fresh gallunts may be added to good black ink but not corked.

Red. The following are the recipes for making ruling ink both red and blue. To make red ruling ink, boil ½ lb. of Brazil wood shavings in 2 qt. of dilute vinegar, then dissolve in it 1 oz. of gum arabic, 1 oz. of sugar and 1 oz. of alum.

Blue. Blue ruling ink can be made by dissolving 1 oz. of sulphate of indigo in 1 oz. of water, and adding 1 oz. of gum arabic and 1 oz. of sugar.

Ink for Renovating Type-writer Ribbons.—*Blue.* Aniline blue, 1 B. 3, parts; distilled or rain water 10; wood vinegar, 10; alcohol, 70; glycerine, 70; *Violet.* Oil soluble aniline violet, 3; crude oleic acid, 4; castor oil, 22. Rub up well. Add a few drops of alcohol. Rub up again.

Re-inking Type-writer Ribbons.—*Things required*: Benzine, petroleum, rectified oil of turpentine, vaseline, powdered drop black (or any aniline colour). The vaseline should be of high boiling point.

Process: Now take spare typewriter spools, or wooden reels or cardboard spools, and wind over them fine darning cotton. Wrap the old typewriter ribbon over it. Unwind portions of the ribbon and place them on an even and hard board. Apply freshly stirred ink with soft paint-brush. Rub in the ink well; very little should appear on the outside.

For colouring matter, prussian blue, red lead, or any aniline colour may be used.

2. Dissolve aniline black 1 part; alcohol, 13 parts; add glycerine and colouring matter to suit. Apply as above.

This subject is fully developed in our forthcoming volume Industrial and Other Openings for Youngmen.

Typewriter-ribbon Violet Ink.—Soft soap, 2 oz.; glycerine 7 oz. by weight; distilled or rain water, 24 oz.; methylated spirit, 50 oz; methyl violet, 1 oz. Mix; filter.

Typewriter-ribbon Red Ink.—Oleic acid, 9 parts; oil soluble aniline red, 3 parts; oil soluble bordeaux red, 3 parts; castor oil to make 200 parts. Heat to boiling point (212° F. or 100° C) for half an hour.

Ink for Writing on Glass.—Pale shellac, 8 oz.; venice turpentine, 4 oz.; sandarac, 1 oz.; oil of tur-

pentine, 12 fl. oz. Dissolve by gentle heat and add 2 oz. of very best lampblack to make black ink. *For Blue ink*, use powdered ultra marine: *for Green ink*. use Brunswick Green; and *for red ink*, use vermillion.

Ink for Writing on Steel.—Copper sulphate, 4 oz.; sulphuric acid, 20 drops; pyrogallic acid, 20 gr.; water to make 4 fl. oz. Write with a copper pen.

Ink for Writing on Sheet tin.—Dissolve 2 oz. shellac in 1 pint of methylated spirit and to remove wax filter through kieselguhr. Add 2 oz. of the very best lampblack. This will impart dead black colour. If shellac be dissolved in turpentine, it will give a glossy black colour.

Solid Inks.—(*a*) Powder and mix well extract of logwood, 100; bichromate of potash, 10; (*b*) Extract of gall nuts, 42; madder, 3; water enough. Macerate for 12 hours. Filter, dissolve green vitriol, 1/5; solution of methyl acetate of iron, 2; solution of indigo, 2. Evaporate to dryness and when sufficiently thick, pour into small moulds. 1 part may be dissolved in 10 of hot water.

Inks for Enamelled Surfaces.—English red, Prusian blue, ultra-marine or other dry colours stirred into sodium silicate solution (water-glass) will make permanent ink for enamelled surface. For quicker drying dissolve 10 parts of bleached shellac and 5 parts of venice turpentine in 15 parts of oil of turpentine, with heat over a water bath. Stir in the dry colours. Mix intimately. To thin add a little more oil of turpentine, if necessary.

Ink for marble slab engraving.—Melt together equal parts of asphalt and oil of turpentine. Fill in.

Ink Paper.—Aniline colour, 1; hot water, 8; alcohol, 2. Mix well and prepare blotting paper as above.

Chemical Blotting Pad.—A cheap and excellent substitute for blotting paper may be made as follows:—Mix 14 parts by weight of gypsum and two parts of potato flour with sufficient water to produce a plastic paste. Pour or press into a suitable mould. As soon as the mass has become hard and dry, it affords an

admirable blotter. This may be made in the form of hand blotter as is usually found in most of the offices.

Copying Paper.—*Blue*. Grind coarsely 820 tolas Paris blue. Mix with 1640 tolas of olive oil. Add $20\frac{1}{2}$ tolas of glycerine. Expose the mixture in a drying room free from dust for a week to a temperature of 40 to 50° C. or 94 to 112°F. At the end of this period grind the mixture as finely as possible in a paint mill. The glycerine makes the hard paint soft and makes it more diffusible. Melt 41 tolas of yellow wax with 615 tolas, of glycerine, and add this to 243 tolas of the blue mixture made above. Mix slowly at a temperature of 78 to 94° F. The mass will be now as thick as honey. Apply to the paper with a coarse brush. Spread evenly and polish with a badger's hair-brush. Place the sheets on an iron table and heat with steam for a few minutes. This mass will be sufficient for two reams of paper 34″ by 20″ *i.e.*, about 5,000 single sheets of carbon-papers sold in the bazar.

2. *Black*. Use aniline black in the same proportion. The work should be done in a well-ventilated room, free from smoke, dust, narcotic fumes etc.

Carbon Papers*.—(*a*) These afford an excellent opportunity for any enterprising man. For the upper white paper, use tissue paper used for making kites ; for the coloured ones any good soft paper may be taken and smeared on one side with a composition of grease and graphite (plumbago, black lead or lampblack). Allow this to remain for 15 hours and then clean off with a piece of cotton or wool to remove any superfluous colour. (*a*) Mix by heating lard, 1 ; wax 1 ; lampblack sufficient. Prepare unglazed papers as in (*a*) and press, (*c*) Lard, 12 ; beeswax, 2 ; lampblack, 2.—Melt, triturate (*a*) and (*b*), with (*c*), and while yet warm, smear with a brush warm papers. Remove excess. (*d*) Printer's ink, 5 ; spirits of turpentine, 40 ; fused mixture of tallow, 1 ; and stearine, 5. Make a homogenous mass by incorporating over a water bath. Prepare a mixture of pyrogallic acid, 15 ; and gallic acid, 5. Stir well. Prepare papers as in (*a*). For coloured papers use indigotin ; for blue, magenta, or violet with methyl violet for red.

* For manufacturing carbon papers use unsized papers.

Other Processes.—1. *Ingredients*: Take finest lamp-black, 5 parts; olive oil or sweet oil, 5 parts; cerasin wax, 1 part; petroleum ether, 10 parts.

2. *Ingredients*: Lamp-black, 5 parts; cerasin wax, 6 parts; olive oil, 5 parts; petroleum ether, 15 parts.

Processes: Weigh the lamp-black and place it in a mortar. Add oil a little at a time and grind finely, so that there is no graininess. Pour into a small dish or pan. Heat gently and add wax; let wax melt completely; stir well; remove to a place free from fire or light of any kind; while still warm, add petroleum ether; apply warm mixture to papers previously heated in an oven. To warm the mixture an electric heater may be used or a bath containing warm water should be brought from outside. After painting the papers with the mixture, place them on waste newspapers and return them to the oven when the mixture will be absorbed by the papers. Half an hour's heating will do. Take out the papers and remove excess with a cotton rag or better silk rag.

To give bluish-black shade add a little prussian blue.

3. Melt 10 lb. of wax and 46 lb. of unsalted lard over fire: add fine lamp-black, 8 lb., and prussian blue, 8 lb. The colours should be dry and free from moisture. Mix well. Avoid clotting. Apply the warm mixture with painter's brush on to papers, cut of proper size. Remove excess by means of a sponge. Good for note-books and type-writers.

4. Mix lard and lamp black. Apply as above. Let papers hang on ropes to dry. Use ordinary printing paper.

5. Melt together 5 parts of castor oil with 1 part of cerasin. Add by stirring 5 parts of lampblack. Remove from fire. Add 10 parts petrol. Apply the solution with a fine brush on paper.

Invisible inks or Secret inks.—Use cheap green cobalt nitrate or chloride solution and water. When being written with, the colour will be pale pink, but on heating, the moisture evaporates. At ordinary temperature the writing is invisible, but on warming the

paper the marks appear *deep green*, but a short while after disappear. In hot climates, the marks will not be seen.

(2) Anything written with a solution of tannic acid will be invisible but can be developed by wetting the paper with a dilute solution of ferric chloride.

(3) **Blue.**—Write with a solution of boiled starch. To show *colour magic*, wet such a paper with water and hold it for a few minutes over the mouth of a bottle containing iodine. The blue iodide of starch thus formed becomes clearly visible. When it fades away again, it may similarly be revived.

(4) **Black.**—Use sugar of lead solution. To make visible, wet the paper and hold it over a bottle of sulphuretted hydrogen. The formation of lead sulphide will give a permanently black colour.

SEALING WAXES.

Black.—Venice turpentine, 9 parts; shellac, 18 parts; resin (*ral*), 2 parts; lamp-black to give the desired colouring.

Blue.—Venice turpentine, 6 parts; shellac, 14 parts; resin, 2 parts; Prussian blue, 2 parts; magnesium carbonate, $\frac{1}{2}$ part.

Green.—Same as Blue, but substitute for prussian blue, king's yellow, 3/2 parts, and Prussian blue, 3/2 parts.

Gold.—Same as blue. For colouring, substitute, gold bronze powder, 2 parts.

Red.—Venice turpentine, 30 tolas; shellac, 48 tolas; vermillion, 66 tolas; magnesium carbonate, 1 tola.

Cheap Bottle Wax.—Rosin (*Sundras or dry ganda behroza*), 16 parts; beeswax, 2 parts; hard paraffin, 1 part; venice turpentine, 2 parts; vermillion, 1 part; bole, 1 part.

Note.—In buying shellac or *chapra lakh* from the market, be sure you get the best quality. Most plate shellac is an admixture of shellac and rosin. Better buy seeds of shellac. Melt the mass in a vessel over fire. Take off the same and strain through a sieve of brass previously heated.

BOTTLE CAPPING WAXES ETC.

(1) Place 7 lb. of good gelatine (try Printer's glue) in 10 oz. of glycerine and 60 oz. of water overnight. In the morning melt over a water bath until intimately mixed. Tint with the desired aniline colour. Store in wide mouthed jars. For application, melt the liquid as above; tightly cork the bottles. Pare the undesired parts of corks, and dip just enough of their necks. The composition will readily set.

(2) **Black bottle wax.**—*Ingredients.*: Common resin, pitch (dry coal tar), ivory black or lamp black, equal parts. Melt together.

(3) Common resin, 20; tallow, 5; lampblack, 4.

(4) **Red bottle wax.**—Melt by heating together common resin, 15; tallow, 4; red lead, 5.

(5) **Red glossy.**—Melt together carefully shellac, 2; resin, 4; in a quite clean copper pan over charcoal fire. Then add $2\frac{1}{2}$ of venice turpentine and $1\frac{1}{2}$ of red lead. Form sticks. Polish with a piece of cloth until they are cold.

(6) Rosin, $6\frac{1}{2}$ parts; beeswax, $\frac{1}{2}$ part; red lead or *saindoor*, good quality, $1\frac{1}{2}$ parts.

(7) Shellac, 3 parts: turpentine, $1\frac{1}{4}$ parts; *saindoor*, $2\frac{3}{4}$ parts.

(8) Rosin, 6 parts; shellac and turpentine, each 2 parts; colouring matters as much as desired.

Any one of the above formulæ should be tried. The ingredients should be heated on slow-fire.

PASTES.

Envelope Gum.—Dissolve 1 oz. of gum arabic in a little water; add 4 oz. of sugar and 1 oz. of starch. Boil the mixture like paste. Take off the fire and thin down with distilled water to the desired consistency.

Gloy.—Dissolve 100 parts of very good starch or dextrine in 80 parts of 5% solution of borax. Boil. Let cool. Add 10 parts caustic soda, 380 Be. Stir. Let alone for at least 24 hours. At the end a clear adhesive will be made. Add formalin as a further preservative.

Gloy Paste.—1, Tragacanth (*gond katira*) powder, 8 tolas; dextrine, 8 tolas; *maida* (white flour), 48 tolas; gum arabic (*gond keekar*), 16 tolas; salicylic acid 1 tola;

water, 4 seers. Mix intimately all the ingredients. Boil with half the water. Be careful to break all the lumps that may be formed. As a thin paste is made, add the remaining water in a thin stream, stirring the mixture all the time. When the whole has been brought to the required consistency, take off the fire and add a few drops of oil of cloves for preservation. Bottle.

2. White flour, 1 lb.; alum, 2 dr.; boric acid,* 2 dr.; water, 1 pint. Make a paste free from lumps, and add acetic acid, 2 fl. oz.; water, 2 pints. Mix. Stir constantly and heat till the required consistency has been obtained. When almost cool, add oil of cloves, 40 drops.

3. White flour, 1 seer; alum powder, 1 chhtk; cold water, 4 seers. Mix well. Pass through sieve Boil for 5 minutes. Cover while cooling. When cold, add 60 drops each of oil of cloves and carbolic acid.* Bottle.

Bookbinder's Paste.—(1) (*Soft*) Water one quart; alum, $\frac{3}{4}$ oz. Dissolve, and when cold, add more water to make it of the consistency of cream, then bring it to a boil, stirring it all the while. Preserve with a few drops of carbolic acid or oil of cloves. (2) (*Hard*) To the above add a little powdered resin and a clove or two before boiling. This will keep for twleve months. If it becomes dry it may be softened with water. (3) Put a teaspoonful of best white starch into a cup, and make into a creamy paste with cold water. Then take a kettle of boiling water and pour over the starch, stirring quickly. When it assumes the consistency of a stiff, translucent jelly, enough water has been added, and it will be ready for use when cold. It is greatly improved if, when set, it is squeezed through a piece of fine muslin. In India, bacteria acts quickly and there is rapid evaporation also. Pates and gloys should, therefore, always be kept in closed containers.

SLATES AND BLACK BOARDS.

Paper Slates.—(*a*) Obtain pieces of good slate from any quarry. Reduce them to fine powder. Sieve. Rub with water upon a slate slab. On its being dry, rub it again with a muller, mixing well with 1/8th

* All these are antiseptics and so preservatives. Oil of cloves and carbolic acid are deodorants too, Biological specimen, are always [illegible]

part of lamp-black and glue water. Boil over moderate fire. Smear thick card-boards with a brush, let dry, repeat once or twice again till a good coat has been obtained. Pumice the card-board and then apply a coat of infusion of gallnuts. Mount the frames. (*b*) Saturate card-board with linseed oil and then give several coatings of the following varnish : Copal varnish, 1 ; turpentine oil, 4 , fine and dry sand, 1 ; ground slate, 2 ; lamp-black, 1.

Slates Artificial.—Artificial slates are made by coating thin iron plates cut to size with a suitable black coating. They are very useful inasmuch as they are not liable to break so easily as the natural stone slates. The coating mixture is made by compounding finely ground slate pieces of the best quality with lamp-black and water glass solution, consisting of equal parts of potash and soda water glass (Specific Gravity, 1.25).

Pulverise equal parts of soda water glass and potash water glass. Boil this with six to eight times its weight of soft river water for 1½ hours. Soft water lathers easily with soap solution ; hard water produces curd or sediment. This will wholly dissolve the water glass. Now take seven parts of fine powder of slate and triturate it with a little water into impalpable dust ; similarly add 1 part of lamp-black and incorporate it with the ground slate. Thoroughly mix the water glass solution. Apply thick or thin coating according to the quality of the slates to be made. The painting must be quite uniform. The roofing galvanised plates can also be painted similarly. This process saves them from oxidation and deterioration. For coating the zinc plates, use only the potash water glass ; soda water glass results in the surface peeling off.

Blackboards, Permanent.—Inset blackboards are made of cement and concrete, or a thick coating of cement is applied over the lime plastered wall. Portable and handy blackboards can be made of strong iron plates. In either case the coating given under the heading of Artificial Slates should be applied.

Blackboard Paint.—(*a*) Shellac, 25 ; lamp black, 20 ; ultramarine, 40 ; Rochelle salt powder, 125 ; pumice stone, 175 ; alcohol, 2253. Dissolve shellac in

alcohol and stir in other constituents. Fill in tightly corked bottles, (*b*) Shellac, 25 : ivory black 10 ; fine powder of emery, 6 ; ultramarine, 5. Prepare as (*a*). Dissolve shellac in methylated spirit. Wood naphtha may be substituted for alcohol if the blackboard be painted on Saturday evening and the room kept open. (*c*) The boards should be painted with ordinary black paint, *e.g.*, one drying with a gloss, when a coating of black paint in turpentine or methylated spirit instead of oil should be given. (*d*) Dilute sodim silicate with water colour with lamp-black. Apply with a brush. An excellent cheap paint.

For further recipes, see Chapter XIV.

Blackboards, Renovation of.—1. Give two thin coatings with vegetable black or lamp-black mixed with 2 parts of boiled linseed oil and 1 part of turpentine. Finish with a mixture of pumice-stone powder or bath brick and vegetable black thinned with 2 parts of turpentine and 1 part of Japan gold size. A second coat should be applied when the finish is quite dead. If this be not sufficient, rub a little over when quite hard with water and pumice-stone powder with a thick flannel cloth.

Now get 3 chhtks of white shellac and half a seer of methylated spirit. Put these into a bottle with enough of lamp-black to give it a thick consistency. Clean the boards ; apply one coat with a soft brush. When dry give another coat so as to have the desired effect. If the whole thing is done properly no chalk marks will be left when the blackboard is rubbed over.

2. A good coating may be made by gold size, a little varnish, bath-brick dust, and thrice as much oil of turpentine.

The renovation of school blackboards should not be entrusted to masons. Often they make a mess of the whole job.

Blackboard Papers.—Shake 1 chhtk of shellac with half a seer of methylated spirit. Dissolve it well. Now grind together in a mortar 1 tola of lamp-black, $1\frac{1}{2}$ tolas of powdered blue, $2\frac{1}{2}$ tolas of powdered rottenstone, 4 tolas of finely-powdered pumice. Add a little

of the shellac varnish made above to make a smooth paste. Then little by little add the remaining varnish, grinding all the time so as to incorporate all the constituents thoroughly. Store in a stoppered wide-mouthed bottle. Always shake before using. Apply two free coats on strong Norwegian tissue-paper or Sialkote or Muttra paper cut into the desired lengths. Mount with rollers and cheap muslin cloth like the wall maps.

The above varnish will equally serve the renovation of School Blackboards.

Too much sand mixed with cement will overmuch scratch the chalk crayons. The coating with paint should never be smooth, otherwise chalk will not write.

School Inset Black-board.—The wall is scratched a little and filled in with concrete and cement, glazed over with a coating of cement, and finally with black-board paint as described above.

DUPLICATORS

Duplicator.—Soak 20 parts of gelatine or English printing glue in a little water for one night. Mix $93\frac{3}{4}$ parts of water and $93\frac{3}{4}$ of glycerine and heat over fire. When well mixed, add 25.2 parts kaolin or china clay and heat for some minutes in shallow tin trays placed on perfectly horizontal board.* Let stand for a whole day. To use this, write on paper with either of the following inks and let dry. Press it on the duplicator; let remain for 3 or 4 minutes when the paper should be removed. Now press blank papers one by one gently, giving a soft rub over with the hand. About 40 or 50 copies can be taken in this way. The ink should be then washed off by means of a sponge. Always keep these duplicators in a cool dry place. In summer, before manipulating the surface of the duplicator, it should be sponged over with ice-cold water. When the surface is worn, the composition of the duplicator can be remelted over water bath and recast.

Hectograph.—For four plates, take gelatine or fine printer's glue, 30 tolas; glycerine, 100 tolas; kaolin, 15 tolas; water in which to soak gelatine, 80 tolas;

* Use spirit level for seeing the level.

a few drops of cloves to be added just before pouring the mass into the plates.

Another Composition consisted of 120 grams of gelatine which absorbed 260 grams of water out of the 400 grams of water in which it was immersed ; to which were added 140 grams of glycerine, and 60 grams of kaolin.

Another Composition: 57 grams of gelatine absorbed 127 grams of water, to which 213 grams of glycerine and 28.5 grams of kaolin were added.

Note on Hectographs.—Before pouring in the prepared mass into the plates the level of the table or the box on which the plates are placed should be found out, otherwise the mass will be unevenly distributed. No bubbles should be allowed on the surface, otherwise the surface will be pitted. All bubbles appearing on the surface should be brushed aside to one corner by means of a feather.

The Hectographs are subject to lose their stiffness with the rise of temperature. A temperature well below 70 degrees may give up to 40 copies ; below 65F. about 50 copies ; below 55F. upto 70 copies. Sized or glazed paper gives more copies for the simple reason that it absorbs less of ink. Rough paper in addition to absorbing more of ink from the duplicating pad injures the surface. In Northern India, the best months for using the Hectograph are November to February. During other months it is difficult to take any copies except on high hills. Hectographs do not last long in hot climates. Southern Indian people, excepting those living on high altitudes need not try the above compositions, for the constituents will not stiffen in those altitudes. Let them try to make a hectograph with some admixture of cement.

Hectograph After "Plex."—Soak 1 part of best gelatine or printer's glue in water for a whole night. Pour off the unabsorbed water. Melt over water bath. Add 10 parts glycerine, ; 4 or 6 parts of fine powder of heavy spar (native barium sulphate) and 1 part of dextrine. Mix well with constant stirring. Pour into the plates. When cool, it is calculated to possess the consistency of a tough and elastic printer's roller, and

can give 40 to 60 copies according to the temperature. For producing the original copy write on tough and smooth paper, and work it as indicated above.

Duplicating Pad.—Kaolin, 45 ; starch. 15. Make a putty with a mixture of 30 parts of glycerine ; 10 parts water, and a little mucilage of gum arabic.

Hectograph Inks.—(*a*) Methyl violet five parts dissolved in an equal quantity of alcohol and 35 parts of water in which 5 parts of gum arabic have been previously dissolved.

Improved Hectograph Ink.—(*b*) Add 1 part of methyl violet in 8 parts of water and add 1 part of glycerine. Warm gently over water bath for an hour or so ; when cool, add $\frac{1}{4}$ parts alcohol. Whenever the ink thickens or grows viscid, thin it with the addition of methylated spirit.

(*c*) To get any desired colour, use any aniline ink. Multi-coloured impressions can be had by using different inks on one and the same paper. The pens should, however, be different, or the same pen can serve if it be properly cleaned each time a new ink is used.

Ink Eraser.—All inks, aniline or vegetable, can be removed by applying solution of hydrochloric acid or oxalic acid. The following two-bottle Ink Eraser is a good commodity for sale ;

Mix 6 oz. of chloride of lime (quite fresh) with 16 fluid oz. of water and shake well until completely dissolved. Leave the solution in a glass-stoppered bottle for a week. Pour off the clear liquid in another stoppered bottle, and add to it a saturated solution of borax 3 fluid oz. In another bottle, dissolve 2 oz. of boric acid in 16 fluid oz. of water, and to it add 3 fluid oz. of saturated solution of boric acid. The first is called the Chlorine Solution and the second the Acid Solution. Apply first the acid solution to the ink, and as it has been absorbed, take away the surplus moisture by means of a blotting paper. Then apply the chlorine solution. The chlorine readily mixes with the acid and sets free oxygen which in its nascent condition attacks the colouring matters. As soon as the ink mark has disappeared, wash away the residue with clean

water and apply clean blotting paper to remove the moisture.

Forgery, Detection of.—If by erasing the ink mark any forgery has been committed it can be readily detected by examining the paper under a magnifying glass, having strong light as of the sun or of an electric lamp in the background, when a marked difference in the texture of the paper will be found; the surface tempered with will appear quite different from the surrounding area.

CHAPTER XVIII.

MANUFACTURE OF TOYS

At the present time the bulk of toys is imported from U. S. A., Canada and Japan. Before the First Great War they were got from Germany.

There is a very large field for toy manufacture in India. Think of the millions of children and you can just have an idea how great is the scope for this industry only if it may be pushed on well and intelligently.

Toys may be manufactured of clay, kaolin, wood, tin-plates, metallic composition, celluloid or rubber.

Clay and Kaolin.—The clay employed should be free from sand. It can be had plentifully from river beds and from alluvial deposits. If pure clay cannot be easily obtained, make a solution of it in water. Sand will be precipitated and on decanting the surplus water, a layer of clay may be obtained above the layer of sand.

Kaolin can be plentifully obtained from Jeypore. There is a hill of kaolin near Nagpur also and strange to say that although large quantities of this earth can be obtained even in India, through our neglect and gross ignorance we have been importing this material from outside. Kaolin can also be obtained from white clay or *pandu* by precipitation just as clay above.

Clay-modelling.—This requires skill but for this purpose the services of a potter should be obtained. Hollow moulds of wood for imprinting the figures should be got manufactured but care should be taken that the image should be as far as possible real, natural and lifelike, otherwise in the long run you may lose

your business through competition. Engravers or block-makers of Calcutta, Bombay, or Lahore, can do this work. This mould should be divided into two separable parts.

After drying these toys, they should be painted with the desired colours; *Peeli mitti,* yellow clay, *hirmachi,* red clay; lamp-black may be employed as desired.

The following colours should be used after baking the toys.

Toys, Non-poisonous colour, for.—"White fine chalk 6 parts, (thoroughly calcined magnesia 3 parts. Add a few drops of indigo solution." For Enamelling see Index.

Tungsten Paints.—"The mineral colours from tungsten are obtained by decomposing soluble tungstates by means of salts of the metals yielding insoluble phosphates. The tugnstate of nickel produces a light green, tungstate of chromium a dark gray, tungstate of cobalt a violet or indigo blue and tungstate of barium a bright white colour. Tungstre acid alone gives a fine light greenish yellow. All these colours may be employed for water, or oil colour paints; the last is a really desirable and probably quite unchangeable colour."

WOODEN TOYS.

Wood.—Wooden toys require the use of a lathe, carved wood toys are not likely to pay. Skill in turning can be acquired only by practice. Hoshiarpore in the Punjab is the centre of Wooden Toys. Apprenticeship of skilled toymakers will be a paying proposition.

Cleaning of Wood.—In most cases, the staining of wood may be effected so as to produce very bright colours without any previous preparation, as generally speaking, the mordants employed have a bleaching action on the wood. But in many cases, in consequence of the quality of the wood under treatment, it must be freed from its natural colours, by a preliminary bleaching process. To this end it is saturated as completely as possible with a clear solution of $17\frac{1}{2}$ oz. of chloride of lime and 2 oz. of soda crystals in $10\frac{1}{2}$ pt. of water. In this liquid the wood is steeped for half an hour, if it does not appear to injure its texture. After this

bleaching it is immersed in a solution of sulphurous acid to remove all traces of chlorine, and then washed in pure water. The sulphurous acid which may cling to wood, in spite of washing does not appear to injure it, or alter colours which are applied.

Roughness of wood should be removed by rubbing it with sand paper. (*See* p. 110)

Colours.—Shellac colours are applied even on the lathe.

Woodwork Colour.—" Fine whiting, 112 lb.; boiled linseed oil, 35 lb. *Process* ; Cover the whiting with water and allow it to stand 5 or 6 hours; then remove the water not absorbed by the whiting and beat the pulpy mass to the consistency of butter, add the varnish and mix well till of a creamy consistency. Stain to the shade required by using colours ground in boiled linseed oil. A small quantity of patent driers may be added if desired. Thin with turpentine and raw linseed oil in equal quantities."

TIN-PLATE TOYS

Tin-plate Toys.—Sheets of tin plates should be obtained for this purpose. The different parts of same toy can be cut separately and then soldered together with tin 2 parts, lead 1 part and, using rosin or zinc as flux. Other toys can be made by the use of pressure dies which can also be made by the engravers.

Paints for metals.—Paint frequently peels off when exposed to the weather. If the metal is slightly covered with a solution of copper sulphate, slightly acidulated with nitric acid, the paint will better adhere to the metal surface. After standing an hour or so, wash, dry and paint.

After this varnish the desired colour may be applied by means of stencils. While the dies should be concave the paint stencils should be convex. You will have to use as many stencils as the number of colours that the different parts of a toy require to be painted in.

If desired tin foil lacquer may be employed. This can be made by dissolving 10½ oz. of shellac in 1½ qt. of alcohol and filtering it. Cover well. Add 5¼ oz. of white gum elemi and 21 dr. venetian turpentine. Stand in warm place, stirring frequently. Filter. The re-

mainder should be pressed out and the filtrate also used. Any colour may be added.

Metallic Solid Toys can be made by running the liquid composition given below in moulds. Finish by painting.

	I	II Composition.
Copper ..	1	10
Zinc	95	80
Iron	1	10

"The iron is used in the form of cast iron shavings added to the zinc. The copper is then added, and the alloy kept fluid for some time, under cover of glowing coals, in order to insure an intimate composition of the zinc. The combustibility of the zinc makes this method of preparation difficult, however, and it is recommended, in preparing large quantities, not to mix the metals directly, but to use brass of known composition, which is to be melted down under cover of charcoal, and slightly overheated. The zinc is then added and finally the iron."

TOYS, COMPOSITION FOR

"Fine ground argillaceous slate, 50%; rag paper waste 20%; burnt plaster 30%; mixed with the necessary volume of water to form a paste, which is then cast in moulds, the moulds having been previously daubed with finely ground slate, powdered plaster or fat. A sufficient thick crust will form in a few minutes, when the residue of the mixture must be poured out of the mould. The mixture which is unbreakable, hardens very rapidly. The castings thus produced may be immersed in paraffin or stearine or they can be japanned. In the latter case it is desirable, so as not to consume too much paint, first to apply a coat of quick drying boiled oil, and when the oil has become hard the article is to be painted.

"Fine parts of sifted whiting, mixed with a solution of one part of glue, together with a little venice turpentine to obviate the brittleness, make a good plastic material, which may be kneaded into figures of any desired shape. It should be kept warm while being worked. It becomes as stone when dry."

Nitre Toys.—Make a hot supersaturated solution of nitre and fill in the hollow moulds like those used in making sugar toys on occasion of *Dewali* or *Deepamala*.

Rubber Toys.—For this purpose substitutes for rubber may be used. See Chapter XXII.

Hollow Rubber Toys.—Purchase pure vulcanized rubber sheets from reliable dealers in rubber stamp manufacturers or from the rubber manufacturers who make a speciality of it. Cut the sheets in required lengths. Cover them with soapstone (Hindi, *Selkhari*), the surplus being rubbed off. For impressions dies described under the heading of tin plate toys may be used. They should be heated in the case of rubber toys to a temperature of 220° F. A pair of Bunsen burners affords a ready means of securing an even and well-regulated temperature. Pressure should be applied for 3 to 5 mts., keeping the press warm as indicated above. If the press is overheated the rubber will be burnt. This is a matter of experience. Practice will make you perfect. When the rubber is nearly vulcanized, it has a bluish shade; a pricked needle should leave no mark. Toys removed from the mould should be rubbed with soapstone.

Celluloid Toys.—Celluloid is manufactured by saturating some form or other of cellulose, *i.e.* linen, cotton, dextrine, starch, potatoes, unsized mixed paper, finely cut and clean white rags, in a mixture of nitric and sulphuric acids for about 15 minutes, pressing it out and transferring to another vessel containing fresh acid (3 parts of sulphuric acid of sp. gr. 1.834 and 2 of strong nitric acid), removing it and washing it thoroughly and then allowing it to dry for a day. The material when still moist is then treated with a solvent as methylated spirit or sulphuric ether, containing gum, resins, colouring matter, etc., in the proportion of 5 lb. of celluloid to $\frac{1}{2}$ gallon, solvent. Heat the mass then in a suitable vessel from 150° to 200°F. when it grows plastic, grind and thoroughly mix, dry at a temperature not above 150°F. and while still plastic put in the required moulds slightly heated, which should be then cooled by pouring cold water over the moulds. For the working of the material, same instruments are required as for the

manufacture of horn. Moulds may be made of brass. For polishing use fine pumice stone and powdered emery in equal parts kneaded with rosin-free hot soap, when the mixture is dried and spread upon the polishing instruments.

Dissolving and Moulding Celluloid (Xylonite). —Place the celluloid scraps in a closed tin canister. Moisten the lot with camphorated spirit which can be cheaply made at home by dissolving camphor in methylated spirit. When softened knead it well to get a uniform mass. Use only brass or iron moulds polished inside. Wooden moulds will not answer the purpose as the porosity of wood fails to give the desired polish. In case plaster of paris moulds be used their inside must be saturated with linseed oil or ghee to remove their porosity, but best results cannot be expected with plaster moulds.

Celluloid, To harden or soften.—The only way of hardening celluloid is to mix 3 to 5 per cent of rosin or shellac with the original pyroxylin (*q.v.* in Directory). To soften celluloid and make it flexible, use castor oil. If carbonate of lime (chalk) or zinc oxide be added to pyroxylin, it will make opaque celluloid, much harder, and more like ivory, fit for making fountain pens. Make experiments on a small scale.

Horn, To Prepare.—Saw the horn into plates or sheets. Remove the pith. Soften the texture by immersing the horn in boiling water for some days. Then subject it to powerful pressure between hot plates. If these plates are in the form of dies, the softened horn will take their shape.

Horn can be made flexible by immersing it in hot water. When bending into the required shape, scrape, and polish with a piece of old felt hat or with flannel having even surface.

Ebonite, Manufacture Of.—Treat seaweeds with dilute sulphuric acid. Reduce them to charcoal by burning. Take 60 parts of this dried charcoal, and mix with 10 parts of liquid glue; 5 of gutta percha and 2½ of caoutchouc (the last two being previously mixed with coal-tar to make them gelatinous). Now add

coal tar, 10 parts; flowers of sulphur finely reduced, 5 parts; alum in fine powder, 2 parts; powdered resin, 5 parts. Heat the mixture to 300°F. On cooling the resultant substance will be found to be equal in many respects to the natural ebony wood, but much cheaper and capable of taking a high polish. The mass is moulded into any shape, screwed into place by a fitting cap, and the mould put into a hot air or steam chamber for some hours. Experience will determine the length of the time the mould should be subjected to the action of steam. When the article has been taken out, scratch off the angularities and the rough surface by means of chisels. Put the article into a quick-revolving lathe and gently subject it to the friction of emery cloth. Finish with soft cloth and olive oil.

Imitation Ebony.—1. To produce splendid black ebony, free from the action of alkalies or acids, apply a solution of one per cent copper sulphate. When quite dry, apply a mixture composed of equal parts of methylated spirit and aniline hydrochloride. Copper sulphate combining with the aniline will form nigrosin.

2. Polish the surface with a mixture composed of 1 oz. of extract of logwood: ½ oz. of liquid ammonia: two glasses of warm water. When this coat is dry, apply a solution made of ½ oz. of iron sulphate in two glasses of water. Finish polishing in the usual way.

3. Brush with dilute sulphuric acid. Expose to the fire. This will char the woody surface and turn it into a fine black and will take a fine polish.

4. Boil together ½ oz. of bruised nut-galls; 4 oz. of logwood chips; 4 oz. of geen vitriol; 1 oz. of iron chloride; tincture with one quart of vinegar. Apply a hot coating. If desired a second coating may be applied.

Ivory, To soften.—Make a solution of 4 chhtks of mandrake in half a seer of best vinegar. Keep it in a warm place for 48 hours. The ivory can then be bent into any shape.

Ivory, Bleaching of.—Shake 1 seer of lime with water for 20 mts. Let settle. Pour off the lime water and immerse ivory in it for 24 hours. Then take out

the ivory and boil it in strong alum water for 1 hour. Dry in the air.

Wax for Artificial Leaves.—Melt together paraffin wax, 20; pale resin, 10. Then add by stirring well 1 part of American turpentine. Less costly than beeswax, but quite plastic, durable and waterproof.

☞ 1. Manufacture only one kind of toys to begin with. Jack of all trades is master of none. The cost of different dies or lathe as the case may be, will be considerable. Again you must keep in hand working capital for store of different materials, wages of labourers, advertisements, etc, As you specialize in one line and secure good business the remaining lines may also be tried one by one.

2. Make a study of the different toys retailed in the market. For this purpose study the shops in big cities. Exercise your ingenuity in devising new toys.

3. It is better to sell these toys through merchants in big cities. In the beginning advertisements in the name of such merchants should be inserted in the leading papers. When business stands on its legs, travelling agents may be employed.

4. Before beginning to work on a large scale, try the experiments on a small scale.

5. What is said of toys holds good in the case of other articles also.

CHAPTER XIX.

LABORATORY RECIPES.

Having been a teacher of science for several years, the Author has tried most of the formulae in the laboratories under his charge. Others in similar position can try them with equal advantage, To encourage the spirit of industrialism science masters ought to give demonstrations of as many processes in this as well as in other chapters to their boys as can be possible with the materials at their command.

Tarnishing.—Magnesium, calcium, aluminium, copper, magnetic iron and sodium tarnish in air ; they do so much more readily in presence of heat and water. The utensils made of these metals cannot be kept quite

bright in the household unless we scrub them occasionally. Notice the colour of tarnish in the case of different metals.

[Platinum, gold, and tin do not tarnish. For this reason both gold and platinum are so highly valued. For the same reason, as well as to beautify, utensils are gilded or electroplated with gold or coated with tin. Vegetables taste nicely when cooked in such vessels. These vessels are, of course, next best to earthen vessels in this respect.]

Nickel tarnishes very slightly, the tarnish being yellow.

Silver is not acted upon by oxygen or by any other constituent part of air, but takes a black tarnish of silver sulphide. Small quantities of sulphur are present in the air where coal is burned or in the air coming in contact with materials containing sulphur, *e.g.*, vulcanised rubber, protein of foods, *e.g.*, eggs and wool, bleached or dyed cotton goods. Soft unbleached cotton goods and tissue paper make suitable rubbings for silver. In the tarnish of copper the carbon dioxide, present in the air plays a part as well, as oxygen and moisture. The product is a carbonate of copper. This is soluble in dilute acids present in fruits, and some vegetables. Bright copper is not acted upon by such acids so that bright copper kettles may be used in cooking. But when copper vessels have been once coated with a black tarnish, cooking in them is injurious to health. The same applies to brass in which copper enters as an important ingredient. So too bronze.

Removal of Tarnish.—For copper, brass, bronze, nickel, use rough venetian red or whiting. Hindustanees generally scrub with sand though this reduces the weight of the vessels more quickly. Ammonia dissolves the oxide of copper and nickel and can be used in polishing these metals. Citric acid, cream of tartar, lemon juice, butter-milk, vinegar, and salt, also serve the same purpose in the case of silver, copper and brass. None of these acting agents should be allowed to remain on the metal for a long time or else they will promote the oxidation of the metal.

To remove grease, oily or fatty substances from the surface of vessels, use watery solution of soda,

(washing or caustic) ammonia, ammonium carbonate, borax or soap. Chalk or rather lime also serves the purpose well but should be removed as soon as possible as chalk has a tendency to stick very hard to the sides of vessels.

Hydrocarbons, *e.g.*, kerosene oil, gasoline, benzine have the same action. A mixture of whiting with alcohol and a few drops of ammonia make a good polish for vessels made of aluminium or silver. To prevent brass from tarnishing apply lacquer composed of one to four ounces of shellac to one pint of alcohol. The vessels to be lacquered are first very carefully cleaned and then the lacquer is applied with a chameleon's hair brush or by dipping.

To remove iron stains from cotton clothes, use oxalic acid. The cloth should be thoroughly washed soon after with pure water and afterwards in water containing a little ammonia. Iron rust on cutlery may be prevented by keeping them dry and brightly polished or covering them with vaseline or oil.

Zinc vessels are acted upon by vegetable acids and as such zinc is not suitable for cooking vessels, soft fruits, milk, or for any acid food.

Filter Papers.—Any bookbinder will cut out round filter papers out of thin blotting papers. 5 to 20% of purified animal charcoal mixed with paper pulp at the time of manufacture will give excellent results. The use of cotton wool or glass powder as placed at the botom of funnel for filtering purposes should alco be encouraged.

Silver, How to Clean.—To keep silver perfectly bright, use plenty of soap water to which a little ammonia has been added. Clean with precipitated whiting.

Cutlery Cleaner.—A solid potato should be cut into two, dipped into brick dust with which rub the blades.

Amalgam for Rubbers of Plate Machines.—See under Metals.

Varnishes for Laboratory Tables—See Chapter XIV.

Old Files, Renovation of.—Clean the files with a file card. Make a solution of 4 oz. of washing soda and

1 quart of hot water. Scrub the files in this solution with a hard brush to remove grease and dirt. Remove them then to a bath of dilute sulphuric acid (1 : 8) for 10 to 12 hours, after which they are taken out and thoroughly washed in water, dried and oiled.

Metallic Apparatus Preservation of.—Before the colleges and schools are dismissed for the summer vacation, all the unpolished metallic apparatus should be smeared with any vegetable oil. Mineral oils are no good.

Rusting, to Prevent.—Make a lacquer with 1 oz. of celluloid, 10 fl. oz. of acetone ; and 10 fl. oz. of amyl acetate. Before applying with a suitable brush, clean and dry well the article.

Preventing Rust.—The following process may be successfully adopted for preventing rust :

Melt slowly together 6008 ounces of lard to 8 ounces of rosin, stirring till cool ; when it is semi-fluid, it is ready for use. If too thick it may be further let down by coal-oil or benzine. Rubbed on bright surfaces ever so thinly it preserves the polish effectively, and may be readily rubbed off.

Flower Barometer.—(*a*) Make paper or muslin flowers of pink and blue colours. Soak in chloride of cobalt. Dry and fix in fancy cardboard boxes. The continuity of the colours as such forecasts wet weather. If pink flower turns to purple or blue to green, the forecast is dry weather. (*b*) Cobalt chloride, 1 ; gelatine, 80 ; water, 100. Normal colour, pink ; in moderate wet weather, violet ; in dry weather, blue. (*c*) Copper chloride, 1 ; gelatine, 10 ; water 100. The colour is yellow in dry weather. (*d*) Cobalt chloride, 1 ; gelatine, 20 ; nickel oxide, 65 ; cupric chloride, 25 ; water, 200. In dry weather the colour is green.

Indications.—The normal colour is pink ; violet in medium humid weather ; blue in very dry weather.

The above can command great sale if the slips of paper forming a brooch be mounted on a cardboard and the whole enclosed within a rectangular tin or wooden box. The box should have a slit in the side and a glass window. It may be then hung up against a wall.

Storm Glass.—" Dissolve 10 grams of camphor, 5 grams of saltpetre and 4 grams of salammoniac in 105 grams of alcohol 90%, and 45 grams of distilled water. After filtering fill glass tubes 2 c.m. wide and 50 c.m. long with this solution, cork up well, above and below, seal, and fix on board."

Indications. —Clear liquid, bright weather ; crystals at bottom, thick air, frost in winter ; dim liquid, rain ; dim liquid with small stars, thunder storms ; large flakes, heavy air, overcast sky, snow in winter ; threads in upper portion of liquid, windy weather ; fog ; rising flakes, which remain high, wind in the upper air region ; small stars in winter on bright sunny day, snow in one or two days. The higher the crystals rise in the glass tube in winter the colder it will be.

Liquor Ammonia.—For laboratory purposes this should be prepared cheaply from ammonia fortis. In summer the bottle should be immersed in ice-cold water for some time before it is opened or else placed in contact with ice-blocks, otherwise on opening the bottle, the liquor will spurt out and may injure the eyes.

The liquor ammonia of commerce is prepared by slowly heating equal parts by weight of sulphate of ammonia (obtained during the distillation of coal-tar or in gas-work) and calcium hydrate (lime water) in a cast iron retort. The gas so generated is passed through a number of Woulff's bottles filled two-thirds with water which absorbs 770 times its volume of gas.

Labels on Tins.—Make a flour paste with $\frac{3}{4}$ oz. of alum to every pound of flour taken. Boil as usual and when cold, stir in 20 to 25% of its weight of genuine honey. Does not corrode metals.

For Label Varnish, See Chapter XIV.

Cutting of Glass.—The diamond piece can be best guided by means of a foot rule. Great skill is required in its use. The sharp end of a file can also serve the purpose of a diamond, the object being to scratch the glass and produce a *locus minoris resistentie* for the glass to break when the pressure is applied. If the glass be cracked, the crack can be made to follow the path of a hot poker. This requires some patience as several applications will be required before the crack

can make any headway. Another process consists in binding a rope soaked in kerosene oil several times round a bottle, setting fire to the rope, and turning the bottle round and round to equalise the temperature and finally when the flame is out, to pour cold kerosene oil over the burnt rope, when the superfluous portion of the bottle will come off. If unsuccessful, the process may be repeated. This also requires considerable skill.

Large holes may be bored in glass with a hard drill moistened with turpentine oil.

Etching on Steel.—Write with a jet tube of glass by means of a solution of nitric acid and acetic acid in equal parts. The ink should be heavy enough in writing. Powder the writing several times with dragon's blood, heating slightly after each powdering. In three or four operations a heavy coating will be obtained. On the top of the dragon's blood sprinkle, plumbago powder and then heat the metal strongly. **Dragon's blood** is made by heating together red sandras, 7; yellow rosin, 9; castor oil, 2; benzoic acid, 3; oxalate of lime, 1; phosphate of lime, 2.

Engraving Mixture for Writing on Steel.—Sulphate of copper, 1 oz.; salammoniac, ½ oz. Powder separately with little red lead to colour it and mixed with 1½ oz. of vinegar. Rub the steel with soft soap and write with a clean hard pen, without a slit, dipped in the mixture.

Etching on Glass.—*See Chapter X.*

Solutions for Batteries.—*See P.* 103.

Etching on Brass Plates.—An easy method to accomplish this end is to get a sketching of the letters or figures that are to be written on the brass plates. Then get a brass plate of the desired side. Let it be polished on one side. Rub the polished side very hard so as to heat it a little. Now rub ordinary white wax or beeswax smartly so as to spread it evenly over the surface. Place a piece of carbon paper with the black side touching the wax surface. Place over it the sketch to be transferred. Now pass a good pencil over the outline on the sketch. Thus the whole outline will be transferred to the wax surface. Remove both the papers as soon as the whole sketch has been trans-

ferred to the brass plate. Now with the end of a sharp needle or a nib without slit, etch the sketch into the surface of the wax, taking care not to etch the unwanted surface. When this has been done, make a wall of wax round the sketch and pour into the trough so made nitric acid. Let it cut into the brass deeply. The nitrous fumes are poisonous and very unpleasant and so the experiment must be performed in open air or in a fuming cupboard. After this remove the wax and polish the surface and fill the etched surface with black Japan varnish.

Rubber Solution.
Glass Cement } *See Chapter* IV.

Rubber Corks, To cut and pierce.—Dip the borer or the awl in soda or potash lye before use.

Rubber Corks, To restore.—By the drying action of heat, rubber corks and gutta-percha tubes often become so hard that they are worse than useless. Make a soda lye by dissolving 5 per cent. of the chemical. Digest the cork for about 10 days. This is best done in the summer when the lye can be kept at the high temperature required. At the end of this period wash the corks and scrape off the outer softer portion with a blunt knife. Wash again with warm water.

N.B.—All rubber goods should be stored in a box containing French chalk.

Chalk Precipitated, To prepare.—Make a solution of 1 part of chalk with 15 of distilled or rain water. Filter. Make also a solution of crystallised soda in distilled water and filter. Add the second filterate to the first gradually until no more precipitate is formed. Let settle. Decant the floating solution. Moisten the precipitate with a little distilled water, and filter. Wash the precipitate 7 or 8 times with pure water and dry the chalk at a moderate heat.

Precipitated Chalk.—This is prepared by adding a solution of carbonate of soda (ordinary washing soda) to a solution of chloride of calcium (both cold) as long as the precipitate forms. The precipitate is well washed with pure water and dried out of dust.

Prepared Chalk or Creta.—Rub one pound of chalk with sufficient water added gradually until reduced

to very fine powder. Put into a large basin of water. Stir it well. After a short time pour off the supernatant turbid water into another vessel. Let the suspended chalk subside.

Earthenware Glaze.—With the help of this glaze, the science master can get many useful apparatus made by local potter, *e.g.*, pneumatic troughs, beehive shelves, church warden claypipes, "T" tubes, jars to keep acids in, etc., etc. (*a*) Make a *frit* by fusing the following in a reverberatory kiln : borax, 30 ; china clay, 5 ; flint, 15 ; whiting, 20. Run into water as soon as it is fused. Then take frit, 50 ; cornish stone, 25 ; white lead, 25. Grind to a very fine powder, make a semi-fluid solution of this preparation and let the previously fired apparatus be dipped into it. The pores of the vessel will absorb the glaze. Take out the vessel and let dry. It should be then again fired in the kiln until a uniform glassy film has been obtained. The temperature for this second firing ought to be moderate, by no means as high as of the first firing. The vessel should come into contact with other supports as little as possible. (*b*) *White Glaze* : Mix thoroughly white glass, 100 ; white sand, 50 ; dry common salt, 40 ; lead oxide, 120 ; tin ashes, 60. Fuse together and powder. Use as (*a*). In order to get a good white coating, the clay with which the pots are made should be ree from iron.

Barometer Tubes, To cleanse.—Put in a little warm nitric acid ; rinse with water ; then with alcohol ; finally with ether ; heat a little to expel ether vapours.

Balances, To clean.—Mix equal quantities of ammonia water, oleic acid, and alcohol. Rub the dirty parts with a piece of cotton dipped in this solution, and polish with a little powder of tripoli (rotten-stone or decomposed siliceous stone).

Zinc, To granulate.—Zinc plates can be obtained cheaply from match-merchants or from haberdashers. The melting point of zinc being 419° C., it can be easily melted in a good coal or charcoal fire or in the furnace of a confectioner. The molten zinc should be poured in a fine stream over cold water in an earthenware trough giving all the while a circulatory motion to the hand. The broken zinc elements of batteries can also be utilised for this purpose. No effort should be made to

purify zinc as only diltute sulphuric acid can react *only* on impure zinc.

Lead Shot, To make.—Get an earthenware sieve made by a local potter with two or three holes in the sides to be hung up from the roof of a big trough of water. While molten lead is being poured from the spout of a crucible into this sieve, somebody should give the sieve forward and backward motion.

BATTERY PREPARATIONS.

Zinc Rods for Batteries.—Make a small platform of kneaded clay. Press into this an old rod or some wooden handle to make a mould. On one end of the mould place a copper wire, and finally pour the molten zinc into the mould.

Carbon Rods for Batteries.—Obtain fine coke and thoroughly pulverise it—the finer the coke flour, the better the results will be. Pass through a fine muslin sieve and mix one-sixth to one-eighth its bulk of fine white flour (*maida*). Make a thick paste with the help of a little treacle. Let stand for two or three hours in a closed vessel, when with the pressure of ram rods it should be pressed into the desired moulds, removed therefrom, dried gently at first and then quickly in a high temperature oven. In the absence of an oven, obtain two shallow plates, one shallower than the other. Place carbon rods packed in an iron box, completely covered over with coke dust to prevent air in the former plate and heat from below, taking care to cover it at once with the other plate. Live charcoal may also be placed on the upper plate.

The iron box or crucible should be covered over with kaolin but not sealed. At first the fire should be slow but later on it should be gradually raised to red hot and kept up for an hour or so, whereafter take off the plates from fire, let cool slowly, and when quite cold, remove the carbon rods and boil in diluted molasses for an hour or so. Remove to dry. Bake again as before. This process is repeated till the desired density has been obtained.

Zinc, Amalgam of.—(*a*) Remove foreign matters with a hard brush of wool rag dipped in dilute sulphuric acid. Place the zinc elements in a shallow tray and

coat over with mercury. (*b*) Mix $1\frac{1}{2}$ lb. of nitric acid with $3\frac{3}{4}$ lbs. of muriatic acid. Put in 1 lb. of mercury. Heat gently to expedite the action. When the quick-silver is completely dissolved, add as much nitro-muriatic acid as before. Apply the solution with a brush.

Pole-indicating Slips.—(*a*) Make a solution of 1 to 2 grams of phenolphthaline in 10 c.c. of alcohol 30% ; add 110 c.c. of distilled water. (*b*) Make another solution by dissolving 20 grams of sodium sulphate in 100 c.c. of water. Pass narrow strips of blotting paper first through (*a*) and when the superfluous solution has been drained off. Dry gently. To use, wet a small slip and place the ends of pole wires $\frac{1}{4}$ to $\frac{1}{2}$ in. apart, when red spot will appear on the negative side.

Manufacture of Aqua Fortis or Nitric Acid.—(*a*) *Single*: Distil 2 parts of saltpetre with 1 of iron sulphate. (*b*) *Double*: Calcine 3 parts of iron sulphate to redness; mix with 6 of saltpetre and 6 of crystals of iron sulphate. Distil. (*c*) *Strong*: For distillation obtain an iron pot with earthen-ware neck and head. Mix equal parts of calcined iron sulphate and saltpetre. Distil. (*d*) *Spirit of Nitre*: Take 4 parts of white saltpetre and one of sulphuric acid and distil into 1 of water.

Aqua Regia.—(*a*) Mix equal parts of nitric and hydrochloric acid. (*b*) *Strong*, : Nitric acid 1 ; muriatic acid, 2. No acid by itself can dissolve gold. It is only in aqua regia that gold can be dissolved, impurity in gold will at once be reacted upon by nitric acid.

Bladders, To prepare.—These should be steeped for a day in water with a little chloride of lime, when the extraneous membranes being removed, they should be thoroughly washed with clean water and dried.

Glass Plates or Window Panes, To cleanse.—Cleaning with methylated spirit is costly while with chalk is clumsy. Window panes may be washed with Monkey Soap. Plate-glass can be polished by the application of the following paste: Calcined magnesia (*mara hua julab ka salt*) should be moistened with pure benzine, as wet as should exude a drop when pressed. Keep the paste in ground glass stoppered bottles. The

articles should be rubbed well after the application of the paste.

Brass Apparatus, To cleanse.—Rub with spirits of ammonia and vinegar and then with blotting paper wetted with spirits of wine.

Leak in Gas Pipe, To detect.—Place a little soap solution on the doubtful spot. Bubbles will be formed if there is a leak.

Charcoal Pencils for Cutting Glass.—Powder together wood charcoal, 180; nitre, 4; benzoin, 2; tragacanth, 4. Make a paste and quickly turn into pencils. Make a crack with a file and lead the crack in the desired direction by means of the lighted end of the pencil.

Corks, Preservation of.—To protect against caustic soda, steep corks in solution of sodium silicate for several hours (1 : 4) and then in lime water. They can then be coated over with melted paraffin. For all other purposes, the corks should be smeared over with vaseline. This not only protects the glass but also does not allow them to jam.

Water-proof Corks.—For the purpose of making corks as impervious as possible, while at the same time keeping them elastic, saturate them with caoutchouc in benzine in ratio of 1 part of caoutchouc to 19 parts of benzine. Into this liquid lay the corks to impregnate and subject them to a pressure of 150 to 180 pounds by means of a force pump, so that the liquid can thoroughly enter. The corks thus treated must next be exposed to strong draught of air until all trace of benzine has entirely evaporated and no more smell is noticeable.

Ground Glass Stoppers, To remove.—Heat the neck of the bottle over any ordinary spirit or gas flame turning it round all the while. The neck having expanded, the cork can be pulled out. This expedient should not be tried, if the contents be inflammable. Wrapping the neck with a rag rung out of hot water sometimes equally serves the purpose.

Paint Remover.—*See Index*. Methylated spirit, 4; oil of turpentine, 4; petroleum spirit, 2;

castor oil, 2. Apply a thin coating, followed by a second coating in a few minutes, when the old coating will come off by means of a blunt spatula.

Steel, To melt, as easily as lead.—Paradoxical and impracticable though at first sight it may appear to be, nothing can be easier than this. Heat the bar of iron strongly. Dip it in flowers of sulphur. The heat produced by the burning of sulphur will make the iron melt. Drops of the liquid metal will fall.

Acids Proof Paint.—9 parts of pure raw rubber should be dissolved in hot linseed oil. Add 1 part litharge and ½ part slaked lime. Colour with red lead or with any other earthy ocher. Boiling should be done over a sand bath.

CHAPTER XX.

SECRETS OF PATENT MEDICINES.

India with its teeming millions is a vast country, where medical relief at thousands of places is not quickly available. To satisfy this crying need, enterprising people should understand the ways and means adopted by medical quacks, and far from cheating the public they should do real service to the country by genuine and well-tried sovereign medicines given in the next Chapter. A single recipe exploited can bring one a fortune. All that is required is a business building capacity.

We cull the following about the medical quacks from Turth's Cautionary List.

MEDICAL QUACKS.

The number of these still tends to increase and to provide a remarkable tribute to the gullibility of the British public, and an almost equally remarkable tribute to the callousness and carelessness on the part of the magazine and newspaper proprietors who assist them in their predatory efforts. This is equally true of India where of late dailies and weeklies have been replete with these advertisements. A large proportion of the names in the List is of Transatlantic origin, and it is worthy of note that many of these, while debarred under a "fraud order" from using the mails in the United States, are allowed to carry on their business in this country with perfect immunity from interference.

Some idea of the price the British public pays for quackery can be gathered from the Inland Revenue returns of the amount received from stamp duty on Patent Medicines. This in 1908 was £328,048 and the approximate value of the medicines paid for works out at £3,230,000. This is by no means the full price, for the physical damage done is of course incalculable.

The quack doctors employ various and novel stratagems to get a whole array of certificates and testimonials. Some are bought of; others are got from interested people; others from those whom the medicines benefit but temporarily; others are forged with fictitious addresses, while not a few off them come from people whom Mother Nature cures even without medicines.

The great secrets of the large sales made by the quacks are :—

(*a*) The gullible public who are not trained to distinguish the dross from the genuine gold, the more troublesome and prolonged a malady, the greater is the chance of the patient falling into the clutches of charlatans for the simple reason that the miserable wretch of a patient is never too slow to catch at a straw.

(*b*) The huge proportions to which the venereal diseases have grown. The sufferer is naturally prone to conceal his disease and ask for treatment through the post. In a province like Bengal where patients of venereal diseases are to be found in millions, the medical quacks have a flourishing trade.

(*c*) The readiness of the newspapers to allow publicity to all sorts of advertisements to swell their funds so that while the Editor writes notes and articles in favour of teetotalism, the manager accepts advertisements for beer, whisky, wine, and all sorts of spirituous liquors. These papers little know how greatly they help in the public being clean fleeced of their hard earned money—the public whose welfare these papers are supposed to look after and promote.

(*d*) Elastic legislation that takes no notice of even the first class cheats.

(*e*) The insatiable lust for gold of physicians on a par with our Anglo-foreign mentors, or rather, our guides, friends, and philosophers, who are disposed to

think that India is everyday growing richer and richer, though in fact quite the reverse is the case and as such they feel not the slightest compunction in charging the *sufedposh* or *bhadrolok* their full fees however inwardly poverty-stricken they may be—they must have their pound of flesh at any rate. No wonder that some of the patients then resort to cheaper but death dealing quacks.

(*f*) Paucity of physicians in rural areas. For this both the Government and our medical graduates coming fresh from the colleges are responsible; the former because it has been trying to transplant in India an exotic system of medicine to the total disregard of far cheaper and wholesome indigenous systems; the latter, because they generally choose to set up in large towns, however poor their remuneration may be.*

HOW THE SWINDLE IS WORKED.

An investigation made by the Ontario Board of Health showed that in the manufacture of many secret preparations all that was required was a barrel of whisky, water for diluting the same, glucose sweetening, some vegetable bitter (the cheaper, the better) and some common tonic or aperient like magnesia or iodide of potassium. In one case the caretaker of a building put up a well known tonic in his spare time. Aloes, which are cheap and a quick purgative, were found to be the basis of a number of pills. In one case in Australia a well known "Essence of Life" was found to contain nothing but distilled water for which a guinea a bottle was charged. The patent medicine man hits on a dyspepsia cure, a blood mixture, a tonic, or a cough cure, whichever he thinks is likely to be most lucrative, and sets to work at once lavishly to advertise its alleged virtues, procure faked testimonials, and commence his campaign on the credulity of the public. "We never canvass for orders," said the manager of a patent medicine to the writer the other day. "If the demand slackens, we just run in one or two large ads."

* This was quite true twelve years back Times have since changed and Mother Necessity is now forcing the new licentiates in medicine to settle in small towns in rural areas The Patent Medicine fraud will, however, continue to work for some time to come.

"Difficulties" in the way!

"Yes, notwithstanding the warnings which from time to time have been published, only a little over a year ago, when the British Home Secretary was asked if he would impose some restriction on the sale and advertising of patent medicines, he replied that 'there were too many difficulties in the way.' Difficulties, no doubt, but not of the nature which should prevent the saving of human lives. Large financial interests, energetic and untiring agents ever ready to squelch any reform which would imperil their trade, disinclination to tax the people through the Customs to make up the deficit caused in the revenue—these are the 'difficulties.' but they are not insurmountable."—*The Patent Medicine Fraud, by Bernard Grace.*

AMAZING DISCLOSURES IN AMERICA.

"Patent Medicines are poisoning people throughout America to-day. Babies who cry are fed with laudanum under the name of syrup. Women are led to injure themselves for life by reading in the papers about the meaning of backache. Young men and boys are robbed and contaminated by vicious criminals who lure them to their dens by seductive advertisements." A campaign against the Patent Medicine Trust in America has been waged during the past year, with these sentences as the starting-point. It has been a campaign big with results, for the Government of the United States, and several of the State Governments have been impelled to take action as a consequence of the exposure of patent medicine methods and the harm done to the public by this industry. To readers in this country the accounts of the evils wrought by patent medicines in the United States will probably come as a revelation. But that will be a revelation full of interest to them we cannot doubt, and for three reasons: First, the medicine business in Great Britain also is one of great power and growing proportion. There were 40,129 makers or vendors in the country in the revenue year 1904-05, as compared with 30.234 ten years before; and the amount yielded to the revenue in duty from medicines in 1904-05 was £331,439, as compared with £234,881 in 1894-95 Secondly, many of the pills and potions which have a large sale in this country are

manufactured in America. The third reason why people on this side of the Atlantic will be interested in hearing of the American exposure is that it has disclosed a remarkable state of affairs existing in the relation of the patent medicine manufacturers to the newspapers in which they publish their advertisements. On this last count we may say at once, in order to prevent misapprehensions that the condition is not one that could repeat itself in England ; indeed that very fact gives the key to its greatest interest for us.

" The people of America spend nearly £20,000,000 a year in the purchase of patent medicines. With the most degraded and degrading, the 'lost vitality,' and 'blood disease' cures, reeking of terrorising, the blackmail ; the writer excuses himself from dealing, as from their very nature these cannot be treated of in a lay journal. But of the alcohol stimulators, the catarrh powder, which breed cocaine slaves, and the opium-containing soothing syrups, which stunt or kill helpless infants, consumption cures—perhaps the most devilish of all, in that they destroy hope where hope is struggling against bitter odds for existence ; of these and other nostrums the writer treats freely. Fraud, he says, is the basis of the trade ; ignorance and credulous hope make the market for most proprietary remedies."—*The Wicked Fraud of Patent Medicines in America.*

HOW TESTIMONIALS ARE SECURED.

Behind the patent medicine advertising stands the testimonial. " We rest on the evidence of those we have cured," cry the owners. " There are the letters, with names and addresses ; there, too, are the portraits." But are the writers of those letters really cured ? Are the testimonials genuine ? Are they honest ? Mr. Adams finds as a result of his investigations, that almost all of the newspaper-exploited testimonials are obtained at an expense to the firm. Agents are employed to secure them. Druggists get discount for forwarding letters from their customers. Persons willing to have their pictures printed get a dozen photographs for themselves. Letters of inquiry answered by givers of testimonials bring a price—twenty five cents. (1*s.*) per letter usually. On the other hand, many testimonials which come unsolicited to the extensively advertised nostrums

are both genuine and honest, but what of their value as evidence? For example, Mr. Adams tells us there is being advertised now a finger ring which by the mere wearing cures any form of rheumatism. The maker of that ring has genuine cure letters from people who believe that they have been cured by it. No one but a believer in witchcraft could accept those statements, yet they are as the bulk of patent medicine letters, and written in as much good faith. A very small percentage of the gratuitous endorsements get into the newspapers, because they do not lend themselves well to advertising purpose. " I have looked over the originals of hundreds of such letters, and more than 90 per cent. of them—this a very conservative estimate—are from illiterate and obviously ignorant people. Yet there is much wisdom in Mr. Adam's observation that anybody's word is good enough for the average. American when he goes into the open market to purchase relief for suffering: if he sets out to buy a horse, or a house, or a box of cigars, he is a model of caution, and he would simply scoff if you showed him testimonials. But when he is seeking to buy the most precious of all possessions, sound health, he will give up his dollar and take his chance of poison on a mere newspaper statement which he doesn't even investigate. Mr. Adams is, of course, writing for Americans, but we may doubt if in the matter of gullibility the average Englishman or Englishwoman is one whit behind the average American."*—*The World's Work and Play.*

FORMULÆ OF PATENT MEDICINES.

The following formulæ of Patent medicines are with a few exceptions the result of the labours of the *British Medical Association, London,* as embodied in their *Secret Remedies,* and *More Secret Remedies.* The probable cost price, excluding packing and advertising charges, and their sale prices are given on pages 76, 78 of *How to Grow Riches.*

COLD AND COUGH CURES.

Owbridge's Lung Tonic.—It claims to cure Coughs, Colds, Asthma, Bronchitis, Influenza, and all affections of the Chest, Throat, and Lungs.

* As for the Indians, the less said the better. If the sale of Patent Medicine is limited in India, it is not because the people are not gullible, but because the average Indian, in this Land of the Golden Sparrow, in this most fertile land, is poverty stricken. Also because the circulation of newspapers is limited —*Editor.*

Constituents:—3 per cent. chloroform ; 2 per cent. alcohol ; 89 per cent. solids ; of the last 73 parts are sugar. Traces of aniseed, peppermint, and capsicum, 0.002 per cent. of ipecacuanha.

Veno's Lightning Cough Cure.—On the label it was stated that :

If it fails, no other medicine will ever succeed. It should be used in all cases of Cough, Colds, Bronchitis, Pleurisy, Sore Throat, Hoarseness, Asthma, Croup, Whooping Cough, Influenza, and Catarrh, In most cases it should be used with Veno's Lightning Fluids.

Dose:—For an Adult, one teaspoonful : for a child under ten, half teaspoonful : for an infant, five to ten drops every two or three hours, during the day only.

Constituents :—7.6 per cent., glycerine ; 16, alcohol ; 0.23 of resin ; 0.2 of alkaline ash ; 1.1 of extractive and colouring matter ; a trace of chloroform.

Keating's Cough Lozenges.—The proportions of the various ingredients found corresponded to ; Morphine 0.007 grain; ipecacuanha 0.07 grain ; extract of liquorice, 2.1 grains ; sugars, 13 grains, in one lozenge.

Beecham's Cough Pills.—It is claimed that persons suffering from Cough and kindred troubles should relieve their minds of the idea that nothing will benefit them unless it be in the form of a lozenge, or taken as liquid. Let them try *Beecham's Cough Pills*, and they will never regret it.

The *Cough Pills* do not contain opium ; they do not constipate ; they do not upset the stomach. On the first symptoms of a cold or chill, a timely dose of Beecham's Cough Pills will invariably ward off all dangerous features. For years many families have used no other Winter Medicine. Householders and travellers should avail themselves of this good, safe and simple remedy for the Coughs in general, Asthma, Bronchial affections, Hoarseness, Shortness of Breath, Tightness and Oppression of the Chest, Wheezing, etc.

The doses may be from three to six pills morning, noon and night.

Constituents :—Morphine, 0.0035 grain ; powdered squill, 0.1 grain ; powdered aniseed, 0.3 grain ;

ammoniacum, 0.3 grain; extract of liquorice, 0.4 grain; in one pill.

Peps.—The claims made are as follows:—

"In the course of scientific research singular freedom from bronchial disease was noticed among the dwellers amidst the rich pine forests of Europe. The great healing powers of the odours and balsams of the pine tree were also observed; and at last a striking connection between the two facts made itself apparent.

"A novel tablet, containing richest pine extracts—that is, with all the best pine essences and odours had captive in them—was eventually perfected; and the tablets, or Peps, as they are called, undoubtedly supply a long-felt want in the family medicine cupboard.

"As a Household Medicine they are of unequalled service in cases of Colds, Coughs, Bronchitis, Sore, Relaxed Throat, Huskiness, Loss of Voice, Asthma, Influenza, Pneumonia, Pleurisy, the Hacking Cough of Consumption, Lung Weakness, Children's Colds, Whooping Cough, Croup, Chill or Tightness of the Chest, the old Breathing difficulty, as well as for many cases of Headache, Flatulence and Indigestion. For many Clergymen, Lawyers, Teachers, and all Public Speakers, they are an invaluable boon."

Constituents:—Sugar about 70 per cent; extract of liquorice about 25 per cent; resinous matter 0.7 per cent.; oil of peppermint trace; oil of anise trace, talc about 4 per cent. each.

CONSUMPTION CURES.

Congreve's Balsamim Elixir.—Claims that it has had a World-wide Reputation; for so many years as the Best Remedy for Consumption, also for Asthma, Chronic Bronchitis, Coughs, Colds, and Whooping Cough, Safe and Effective. Free from any poison.

"In the most obstinate attacks of Asthma, which have threatened speedy suffocation, when the sufferer, harassed by excessive coughing, has laboured dreadfully for breath with an acuteness of agony not to be described, this Balsam has restored the patient to health, after the medical practitioner had abandoned the usual means in despair.

"In Pulmonary Consumption, the best remedy is this Balsamic Elixir, as most unquestionable Testimonials prove. It has been successfully prescribed in consumptive cases regarded as hopeless by the first class physicians."

Constituents :—28.5 per cent. alcohol, 2.6 per cent. of total solids, 0.5% resinous matter, 1% sugar, a little tannin, colouring matter (apparently cochineal, and extractive). The resin is similar to benzoin, storax tolu, or balsam of Peru, perhaps a combination of two.

Tuberculozyne.*—" Tuberculozyne (Yonkerman) was such a marvellous remedy that when its discoverer first announced he could cure consumption, there were few ready to believe. He had, however, discovered certain salts of copper of remarkable therapeutic value, and his production was immediately subjected to the most elaborate and rigid demonstrative tests . . . . .

"The consumption germs (tubercle bacilli) cannot live in the presence of copper and as the Tuberculozyne treatment introduces copper into the blood, the consumption germs cannot live. . . . . ."

The directions were : After each meal put 20 drops of the medicine from each bottle into a tumbler of milk, stir well and drink immediately. If milk is distasteful, the medicine may be taken in water which has been boiled. For patients between the ages of seven and fifteen years, give one-half of the above dose; for those under seven years, give 5 drops only, from each bottle.

Constituents :—Potassium bromide, 3/4 parts ; Glycerine, 12.0 parts ; Oil of cassia, 0.1 part ; Tincture of capsicum, 0.17 parts ; Cochineal colouring q.s. ; Caustic soda, 0.06 part ; water to make 0.06 fluid parts.

Of bottle No. 2:—Glycerine, 18 parts ; Essential oil of almond, 0.1 part ; Burnt sugar q.s. ; water to make 100 fluid parts. The quantity of crystallied copper sulphate was 1.48 gr. in each fluid drachm.

HEADACHE CURES.

Stearn's Headache Cure.—Claims to be " A Speedy, Certain and Safe Cure for Headaches of all origins, whether Sick, Bilious, Nervous or Hysterical."

*Thirty-three years back the author of this book tried this medicine on a patient. From the moment it was administered the last lingering hopes of life were extinguished and the patient was hastened to an early cremation ghat

Constituents :—Analysis showed the composition of the powder to be : Acetanilide, 3.92 grains ; Caffeine, 0.98 grain ; Sugar of milk, 4.90 grains.

The dose was one wafer. " If relief is not obtained, repeat in an hour, but more than two wafers should not be taken."*

The above quantity is for one wafer or cachet. These wafers can be obtained from any respectable druggist.

The Editor of this volume once manufactured these wafers on a large scale. There is no doubt about it that the wafers do cure headaches.

BLOOD PURIFIERS.

Clark's World-famed Blood Mixture.—Claims: " It never fails to cure Scrofula, Scurvy, Scrofulous Sores, Glandular Swellings and Sores, Cancerous Ulcers, Bad Legs, Secondary Symptoms, Syphilis, Piles, Rheumatism, Gout, Dropsy, Black-heads or Pimples on the Face, Sore Eyes, Eruptions of the Skin and Blood, and Skin Diseases, of every description.'

Constituents :—Potassium iodide, 52.5 grains ; Spirits of sal volatile, 10 minims ; Spirit of chloroform, .67 minims ; Simple syrup, 50 minims ; Burnt sugar *q*.s.

Harvey's Blood Pills.—*Constituents* :—Quinine sulphate, 17 grains ; Potassium iodide, 22 grains ; Powdered rhubarb, 16 grains ; Powdered liquorice, 8 grains ; Extract of sarsaparilla, 12 grains ; Extract of burdock, 12 grains ; Extract of taraxacum, 12 grains. Divide into 36 pills.

HUGESS BLOOD PILLS.

Constituents :—Aloes, 0.7 grain ; jalap rosin, 0.2 grain ; powdered cinchona bark, 0.2 grain ; powdered ginger, 0.2 grains ; oil of cloves trace. In one pill.

OBESITY CURES.

Marmola—*Constituents:*—In one dose: Dried thyroid gland—14 per cent. or 1.4 grain ; Phenolphthaline, 4 per cent or 0.4 grain ; Sodium chloride, 7 per cent. or 0.7 grain ; or powdered *Fucus vesiculosus*, 50 per cent or 5.0 grains ; extractive 25 per cent. or 2.5 grains ; oil of peppermint trace.

* Both acetanilide and caffeine are heart depressents and so the inadvisability of taking too much of poisons—*Editor*, Industrial Encyclopædia.

Dr. Vincent's Anti-Stout Pills.—"Are small, harmless, pleasant to take, and without change of diet, will reduce superabundant flesh as much as 10 lb. in a week."

A printed circular and a circular letter were sent with the pills.

Constituents :—Weight of one pill being 2.6 grains, contained jalap, colocynth, cloves, aloes or extract of aloes, extract of *Fucus vesiculosus*

SKIN DISEASES.

Whenever one has taken to such a treatment one is invariably drawn into buying a special ointment, a special soap, or some dusting powder.

Antexema.—It claims : In most cases "Antexema" will by itself effect a cure, but the permanence of this is assured by the continued use of a suitable soap, and the cleansing and purifying action of " Antexema Granules " on the blood.

" Antexema " is the most efficacious remedy known for the relief of all inflamed conditions of the skin. Its beneficial effects are not confined to the curing of Eczema, Psoriasis, Nettlerash, Erysipelas, Boils and other serious troubles, but it is also by far the best remedy for Cuts, Burns, Sores, Bruises, Chilblains, Blisters, Insect bites, and every variety of trouble to which the skin is liable.

Constituents :—Soft paraffin, 35.4 per cent. ; Boric acid, 1.5 per cent. ; gummy matter, 12.4 per cent. ; water, 50.7 per cent.

The gum resembled in some respects a mixture of acacia and tragacanth, but could not be exactly identified.

Cuticura Remedies.—"In the treatment of torturing, disfiguring, itching, scaly, crusted, pimply, blotchy, and scrofulous—humours of the skin, scalp, and blood, with loss of hair, the Cuticura Remedies have been wonderfully successful. Even the most obstinate of constitutional humours, such as bad blood, scrofula, inherited and contagious humours, with loss of hair, glandular swellings, ulcerous patches in the throat and mouth, sore eyes, copper-coloured blotches, as well as boils, carbuncles, sties, ulcers, scrofulous rheumatism,

and most humours arising from impure or impoverished condition of the blood, yield to the CUTICURA SYSTEM OF TREATMENT in the majority of cases, when the usual remedies fail."

Cuticura Ointment.—On analysis was found to consist of a mixture of hard and soft paraffins slightly perfumed with rose essence, and coloured green. The chief green colouring matter present appeared to be an analine dye and a mixture of paraffins, coloured with a trace of malachite green and a little chlorophyll, agreed very closely with it in its properties. No other ingredient could be discovered.

Cuticura Resolvent.—Claims to be alterative, antiseptic, tonic, digestive, and aperient, and is confidently believed to be superior to other preparations for purifying the system of humours of the skin, scalp and blood, with loss of hair.

Constituents :—Potassium iodide, 17 grains ; sugar and glucose, 486 grains ; extractive, 8 grains ; alcohol, 10 fluid drachms ; water to make 6½ fluid ounces.

Zam Buk.—This preparation claims to be efficacious in hundred and one skin diseases, a long list of which is enclosed with the ointment. According to the directions on the box, Bruises, Cuts, Sores, Sprains, Open Wounds, Sore Breasts, Inflamed Patches, Ulcers, Eczema and Piles. First cleanse the parts with pure water and then apply Zam Buk direct or on a piece of clean lint. For Burns, Scalds, etc., rub Zam Buk lightly over the injured part and cover same as soon as possible in order to exclude the air. To use Zam Buk as an Embrocation rub it in well, both into the muscles and tendons, when the healing, stimulating and strengthening ingredients in Zam Buk will be absorbed into the system.

Constituents :—Oil of eucalyptus, 14 per cent. (approximately) ; Pale resin (colophony) 20 per cent. (approximately) ; Soft paraffin, 5.5 per cent. (approximately) ; Hard paraffin, 11 per cent. (approximately) ; green colouring matter trace (approximately).

CHILDREN'S MEDICINES.

Woodward's Gripe Water.—The label says : Woodward's Celebrated Gripe Water, for Infants'

Preservative, without Laudanum, for all disorders of children, *viz.*, Convulsions, Gripes, Acidity, Flatulency, Whooping-Cough, and the distressing complaints incidental to infants at the period of their Teething allaying the pain, giving instant relief, and rendering this crisis perfectly mild and free from danger.

Constituents :—Sodium bicarbonate, 1.08 per cent. ; essential oil of caraway, dil. and perhaps of anise, 0.03 per cent. ; alcohol, 3.8 per cent. ; sugar, 20.5 per cent.

For other Recipes of Gripe Water, see next Chapter.

PILES.

Homocea.—It claims :—Homocea..... Ointment is far and away the best remedy known for Open Wounds, Sores, Cuts, Ulcers, Bad legs, Scalds, Chaps, Wasp, Bee, and Insect Stings, Earache, Inflamed Spots, Skin or Flesh Troubles of all sorts. Broken Chilblains, etc. In treating any of the above lay Homocea lightly with the finger, or spread some on clean rag or lint and apply to the parts affected. For Bruises, Blotches, Chaps, Chilblains (unbroken), Eruptions, Swellings, Mumps, Croup, Sore Eyes, Rashes, Ringworm, Jelly Fish Stings, Sunburns, etc., etc., smear or gently rub in Homocea where required.

For Piles (bleeding or blind) Homocea stands alone amongst remedies. It affords immediate relief at all times and in many cases absolutely cures.

For Internal Piles the insertion of Homocea Suppositories is recommended.

Cold in the Head is cured by putting Homocea up the nostrils and rubbing the bridge of the nose well with the Ointment at night.

Soft Corns and Bunious are cured by applying Homocea as a pad, to be kept on day and night.

Eczema (in many forms), Hay Yever, Prickly Heat Jigger, and Veldt Sores, Warts, etc., cured by Homocea.

Homocea will cure the Bites and Stings of Mosquitos, Gnats, Sand Flies, and, better still, will prevent these pests from attacking you, if the face, neck, hands and other exposed parts of the body are smeared with the Ointment

Constituents :—Oil of eucalyptus, 25 per cent. ; Oil of lemon, 0.2 per cent. ; Beeswax, 25 per cent. ; Fat, 49 per cent. ; Solution of ammonia, 0.8 per cent.

The characters of the fat agreed with those of a mixture of lard and cocoanut oil in about equal parts.

DRINK CURES.

Dipsocure.—The weight of these powders varied from 2.9 to 6.0 grains in one packet and contained Acetanilide, 6 parts ; Potassium bromide, 35 parts ; Sugar of milk, 59 parts.

Antidipso.—According to directions given, one powder dissolved in half a tea-cup or hot coffee, whisky, milk, gin, etc., using either Brown or White Powder as colour of liquid may require 3 times a day before meals.

Constituents :—White Powders ; Potassium bromide, 24.5 parts ; sugar of milk, 75.5 parts.

Coloured Powders : Potassium bromide, 25 parts ; Sugar of milk, 65 parts.

CURE-ALLS.

William's Pink Pills for Pale People.—According to the circular when the muscles and nerves are tortured by poisons in the Blood, be it the result of Rheumatism, Sciatica, or Lumbago, the only way to cure is to enrich and purify the Blood. Dr. William's Pink Pills, in this way alone, have cured not only Rheumatism, but Anæmia, Indigestions, Palpitations, Influenza's After-Effects, Eczema, Sciatica, St. Vitus' Dance, Spinal Weakness, the many forms of Nervous Disorders dreaded by men ; also the special ailments of women.

Constituents :—The pills appear to be nothing but a form of Blaud pills. One pill contains exsiccated sulphate of iron, 0.75 grain ; Potassium carbonate, anhydrous, 0.66 grain ; Magnesia, 0.08 grain ; Powdered liquorice, 14 grains ; Sugar, 0.2 grain.

Beecham's Pills. —According to the circular it is averred that these renowned pills are composed entirely of Medicinal Herbs ; and cure Constipation, Headache. Dizziness or Swimming in the Head, Wind, Pain, and Spasms of the Stomach, Pains in the Back, Restlessness, Insomnia, Indigestion, Want of Appetite, Fullness

after Meals, Vomitings, Sickness of the Stomach, Bilious or Liver Complaints, Sick Headaches, Cold, Chills, Flushings of Heat, Lowness of Spirits, and all Nervous Affections, Scurvy and Scorbutic Affections, Pimples and Blotches on the Skin, Bad Legs, Ulcers, Wounds, Maladies of Indiscretion, Kidney and Urinary Disorders and Menstrual Derangements.

Constituents :—Aloes, 0.5 grains ; Powdered ginger, 0.55 grain ; Powdered soap, 0.18 grain in one pill.

Amritdhara.—Various rival preparations have been put on the market claiming to cure a long line of diseases. The patient is advised to use different prescriptions in which he is asked to put a few drops of Amritdhara, etc. All of these preparations essentially consist of peppermint, thymol, and camphor. The colouring matter can be given with a little tincture of saffron. Some manufacturers add various other chemicals, as opium, carbolic acid, essence of onion, essence of orris root, etc., etc.

Mother Seigel's Curative Syrup.—It claims to cure dyspepsia, impurities of blood, and all liver complaints.

Constituents :—Dilute hydrochloric acid (B.P.) 10 parts by measure ; Tincture of capsicum, 1.7 part by measure ; Aloes, 2 parts ; Treacle, 6 parts ; Water to make 100 parts by measure.

THE ILLS OF HUMANITY.

Dr. Kidd's Treatment.—In a pamphlet entitled as above, about hundred diseases are fully described, every single account terminating in recommending William Kidd's Treatment. One is to take one Tablet " A " before breakfast ; one Tablet " B " before dinner ; Tablet No. 18 before supper, Tablet No. 7 after dinner and after supper ; one Tablet No. 45 on retiring.

Tablet A was coloured pink, sugar coated over a chalk cover. The decoated tablets weighed about 3¼ grains each ; they contained 52 per cent. of sodium bicarbonate and the remainder consisted principally of a bitter extract agreeing in all respects with extract of gentian ; small quantities of potato starch and a substance of resinoid nature, which could not be identified, were also present. Tablet B was coloured

bluish-purple but in other respects was just the same as A. Tablet 18 was white and consisted of 1 gr. of sodium benzoate, a trace of oil of wintergreen, and some bitter resin. Tablet 45, coloured pink, contained aloes, ginger extract, a little resin, (probably jalap or scammony resin), and potato starch. Tablet 7, about 6.5 gr. each, consisted principally of charcoal, with some sugar and a very little saccharin.

Dr. Cassel's Blood Cleansing Tablets.—Constituents :—Phenolphthaline, 0.75 per cent.; Potassium iodide, 1.26 per cent.; Sugar, 81 per cent; Talc, approximately 11 per cent.; Calcium carbonate and sulphate, approximately 2 per cent.; water, 1 per cent.; Extractive, 3 per cent.

ELIXIRS OF LIFE.

Phosferine.—It claims to be the Greatest of all Tonics. A proved Remedy for Nervous Debility. Influenza, Indigestion, Sleeplessness, Exhaustion, Neuralgia, Maternity Weakness, Premature Decay, Mental Exhaustion, Loss of Appetite, Lassitude, Neuritis, Faintness, Brain Fag, Anæmia, Backache, Rheumatic Headache, Hysteria, Sciatica, and disorders consequent upon a reduced state of the nervous system.

Constituents :—Quinine sulphate, 0.67 part; Diluted sulpuric acid, 2.5 parts by measure; Diluted phosphoric acid 5.46 parts by measure; Alcohol, 8.1 parts by measure; water, to make 100 parts by measure.

Guy's Tonic.—It claims to cure all disorders of the digestive system, all functional derangements of the liver, all disorders of the blood, all sorts of nervous maladies and disorders characterized by perverted nutrition and lack of vital force, etc., etc.

Constituents :—Diluted hydrochloric acid, 0.59 part by measure; diluted phosphoric acid, 0.52 part by measure; alcohol, 2.27 parts by measure; Compound infusion of gentian, 40 parts by measure; Chloroform water, 50 parts by measure; Cochineal colouring, a sufficiency; water, to make 190 parts by measure.

Gordon's Vital Sexualine Restorative.—The pamphlet sent is entitled as :—

" A Confidential Treatise on Nervous Exhaustion, Spermatorrhœa, Varicocele, Generative Weakness,

Debility, Special Diseases and Urinary Derangements in Men. *Their Cause and Cure.* By Concentrated Herbal Remedies. A popular Practical, and Moral Exposition of some of the Fundamental Problems of Sociology. By Charles Gordon, P. M. B." P. M. B. is no degree, though it gives an appearance of one.

It claims permanently to cure Neurasthenia, Nervous Breakdown, Brain Fag, Depression, Loss of Energy, Sleeplessness, Nervous Headache, Melancholia, Trembling, Poverty of Nerve Force, Nervous Prostration, General Weakness, Loss of Strength, Exhausted Vitality, Premature Decay, Brain Wreckage, Neuralgia, Nerve Tiresomeness, etc.

Constituents:		Or in one Dose.
Iron hypophosphite	..0.50 part	.. 0.27 grains.
Calcium hypophosphite	..0.50 ,,	.. 0.27 ,,
Sodium hypophosphite	..0.60 ,,	.. 0.32 ,,
Potassium hypophosphite	..0.14 ,,	0.07 ,,
Quinine sulphate	..0.50 ,,	0.27 ,,
Citric acid	..0.90 ,,	0.48 ,,
Sugar (approx.)	..51 parts respectively.	
Glycerine (approx.)	..36 parts by measure.	
Colouring matter	..A sufficiency.	
Water	..To 100 parts by measure.	

Sequarine.—A circular letter says : 'Since the introduction of Sequarine into England an ever-increasing number of sufferers have taken this treatment with remarkable success. The name of Dr. Brown-Sequard, L.L.D. (Cambridge), Fellow of the Royal Society and Fellow of the Physicians (London), is a sufficient guarantee of its efficacy.

It claims that Sequarine is a cure for any ailment or weakness brought about by lack of nerve power or an accumulation of impurities in any part of the body.

Constituents :—Alcohol, 9.85 per cent. ; oil of peppermint to flavour ; 1.9 per cent. of solid chemicals principally sodium and potassium phosphates ; 1.4 per cent. of protein.

Note :—This Patent Medcine was once tried by the Author of this Encyclopædia. He found it quite worthless.

INDIGESTION : CONSTIPATION.

Chas. Forde's Bile Beans.—Claims to be "absolutely unequalled" for biliousness and other complaints, including anæmia, piles, influenza, despondency, blackheads, rheumatism. Chas, Forde's also cure Fatty and Waxy Degeneration of the "Liver, Hobnailed" or "Gin-drinker's" Liver (Cirrhosis), and the host of ailments having a common origin in impaired digestion, assimilation, and secretion, and in defective working of the excretory organs. Chas. Forde's are likewise of inestimable service in all the disorders pecualiar to women, while as a general aperient and tonic remedy they are unsurpassed.

Constituents :—Gelatine coating, coloured black : aloin, powdered cardamoms, oil peppermint, wheat flour, extract of colocynth. One pill weighed 2.3 grains.

For Indigestion Mixtures, and Indigestion Tablets, see next Chapter.

Carter's Little Liver Pills.—They are described as purely Vegetable. For Headache. For Dizziness. For Biliousness. For Torpid Liver. For Constipation. For Sallow Skin. For the Complexion.

Constituents :—Sugar coat, aloes (Barbadoes) podophyllin, powdered liquorice root, wheat starch. The weight of a single pill without coating was $\frac{1}{3}$ gr.

For genuine Liver Pills and Liver Mixtures, see next Chapter.

Holloway's Pills.—An advertisement says that Holloway's pills have positively no equal for thoroughly cleansing the system and putting the liver and kidneys in functional order, without pain or griping.

Constituents :—Aloes, ginger, rhubarb, and soap. Average single pill weighed 2.4 gr of Beecham's Pills.

Cockle's Pills.—They are not recommended as a panacea, nor are they adapted to all complaints ; but as a mild and efficacious *aperient* and *tonic* in the various forms of Indigestion, with intestinal irregularity ad-

mitting their use, it will not, perhaps, be exaggeration to state that they have been resorted to under all systems of diet, changes of climate, or atmospheric alternations, with an extraordinary degree of success, for a period extending over more than half a century.

Constituents:—Aloes (Soctrine), a little soap, powdered colocynth, powdered jalap; average weight of a pill 4 grains.

All these pills have a family likeness to Beecham's Pills, the forerunner of all these nostrums. Indeed the mountain of wealth piled up by Beecham must have lured these followers to follow suit.

FLESH PRODUCERS.

Sargol.—" Whether your lack of bodily weight comes to you by inheritance, by over-work, by indoor occupation, or no matter what you have done or how many ineffectual preparations you have tried, Sargol will be a revelation to you."

Constituents:—Zinc phosphide, 0.7 per cent.; Letcithin, 1.9 per cent.; Calcium hypophosphites, 12.9 per cent.; Sodium and potassium hypophospites, 7.7 per cent.; Albumen (soluble), 4.2 per cent.; insoluble protein (? coagulated albumen), 10.8 per cent.; Sugar, 18.0 per cent.; Talc, kaolin, moisture, etc. Average weight of a tablet, 5.3 grains.

HAIR PREPARATIONS.

Tatcho (Hair Grower):—" If your hair has become scanty or grey, get " Tatcho " to-day. It will bring back the hair of your youth, make a new being of you, and give you a new grip upon life.

According to directions, sprinkle a few drops on the head each morning, and brush the hair thoroughly after application.

Constituents.—Borax, 2.7 parts; Glycerine, 2.5 parts; Quinine, 0.006 part; Formaldehyde solution, (40 per cent.) 0.38 part; Colouring matter (brownish-yellow), and perfume traces; alcohol, 2.4 parts by measure; water sufficient to produce 100 parts by measure.

Edward's Harlene.—A booklet says that "Harlene" alone answers all requirements; it has the property of penetrating direct to the roots of the hair, stimulating

them to renewed vigour, cleaning the cells which line the way; and, above all, it conveys to the hair-bulbs the peculiar food which they require—the only food they otherwise obtain from the blood. No other preparation contains this ingredient, and, therefore, no other preparation can be successful.

Constituents :—Borax, 0.5 part; Additional alkali, equivalents to anhydrous sodium carbonate, 0.04 part; solution of ammonia (80 per cent.), 0.12 part; glycerine, 0.4 part; brown colouring matter and perfume traces; alcohol, 5.7 parts by measure; water, sufficient to produce 100 parts by measure.

Koko.—Claims that it eradicates Scurf. Promotes Growth. Prevents Hair Falling. Contains no Dye. Will positively Stop Hair from Falling Out, and prevent it turning Prematurely Grey. Will certainly increase the growth of the hair, and if consistently used will make it bright, soft, and wavy.

Constituents :—Borax, 1.4 parts; Glycerine, 17 parts; formaldehyde solution (40 per cent.), 0.1 part; perfume traces; alcohol, 3 parts by measure sufficient to produce 100 parts by measure.

Lockeyer's Sulphur Hair Restorer.—Claims that it restores the colour to Grey Hair. Instantly stops the Hair from fading. Occasionally used, Greyness is impossible. If the Hair is actually Grey the Sulphur Restorer in six or seven days effects a great alteration. By a gradual action, scarcely perceptible even to watchful observers, several darker shades will be attained. In a period of three weeks a complete change occurs, and a colour exactly resembling that lost will become manifest.

"Where the Sulphur Restorer is applied scurf cannot exist, and a sense of cleanliness, coolness, etc. prevails."

Constituents :—Precipitated sulphur, 1.3 parts; lead acetate, 1.6 parts; lead sulphate, 0.4 part; glycerine, 9.6 parts; rose water sufficient to produce 100 parts by measure.

The lead sulphate was probably due to some reaction having occurred between the lead acetate and sulphur, with oxidation; assuming this to be so, the

amount of lead acetate originally present would be 2.1 parts.

Seeger's Hair Dye.—The directions say: "Before applying Seeger's, wash the hair in lukewarm water in which you have melted a piece of ordinary household soda of the size of a walnut to each quart of water you use. Then, when the hair is perfectly dry, pour a little of the dye into a clean saucer, dip the teeth of a perfectly clean fine tooth-comb into the dye in the saucer, and pass the comb several times through the hair where it is required to be dyed. Now allow the dye to dry on the hair. While the hair is drying, comb it now and then, so that the dye, which does not become visible for some hours, may come in contact with the hair and an equal shade be obtained. The day following, the dye which has not dried can be washed out with clean water without soda."

Constituents:—Pyrogallic acid, 3.8 parts; Cupric chloride (anhydrous), 1.8 parts; Hydrochloric acid (*B.P.* strength), 0.75 part; Sulphuric acid, 0.07 part.

Shadeline.—Claims to regenerate and develop the original grey colour of hair, tinting them perfectly a natural colour.

Constituents:—Pyrogallic acid, 2.1 parts; Cupric chloride (anhydrous), 1.3 parts; Hydrochloric acid (*B.P.* strength), 0.3 part.

For other Hair Preparations, see Chapter XV.

FROM TRUTH'S CAUTIONARY LIST.

Kaufmann's Sulphur Bitters.—A Yankee quack importation for British fools. Claimed to have been recommended by spirits at a seance to a scrofulous lady.

Kidd, "Dr." James William.—Baltimore, U.S.A., and of 423, Saracen's Buildings, Snow-hill, London.—Advertises profusely all over the world, offering to cure all diseases, and to send a sample of treatment "free." The remedies appear to be an absolute humbug, and are supplied in quantities at extravagant prices, as much as £4 having been obtained from victims in some cases.

New Life Nutrient.—61, New Oxford Street, London, W. "The Essence of life in one small tablet blended," sold by a "Dr. Muller," at 10s. 6d. for a four weeks' supply. (Vol. 76, p. 1034.)

Nutriola Company, Chicago, and Tiverton Mansions, Gray's Innroad, London, W.C.—The enterprise of a Yankee named Hanson, the "President" of the company. Not content with advertising its ability to cure everything, the company has also advertised purchase of its shares as the shortest way to wealth. An English company has been formed to take over the English business, but has shown few signs of activity.

Oxydonor.—A piece of brass pipe closed at each end and containing stick of carbon. It is sold by a "Dr." Hercules Sanche of 11, Queen Victoria Street, London, E.C., and Montreal, Canada, as a cure all. In an action for an infringement of the patent for its manufacture a United States Court held that such palpable humbug was not entitled to legal protection. (Vol. 68, p. 1218; Vol. 69, pp. 779, 1595.)

Oxygenator.—A rival instrument to the Oxydonor (see above) manufactured by the Oxygenator Co. of Buffalow, New York, and sold here by the Oxygenator Central Agency, 54 Millimount Road, and 50, West Street, Sheffield. It is as valueless as the Oxydonor. and its importation into Australia has been forbidden by the Government.

The "Oxypathor" *in India is a similar instrument. Dr. Mann appositely exposed this worthless instrument in his "Herald of Health" (Lucknow), and when the present writer drew the attention of the proprietor to this fact, the latter threatened to bring an action against Dr. Mann. This was in* 1913. *Till now, we have heard of no such action having been brought.*

Sanden Electric Company—(The Dr.)—Vendors of an Electric belt, trading in South Africa, India, Brazil, and the Argentine, the representative of which has been fined for representing himself as a qualified medical practitioner. Has also recommended its appliances as a tonic for debilitated race-horses. (Vol. 67, p. 560.)

The present writer bought an Electric Belt for Rs. 75 on instalment plan. Rs. 25 was paid at once.

Though Dr. Sanden held out hopes of the Belt Curing Backache, it proved worthless. On intimitating to Dr. Sanden that the Belt would be returned, the writer was informed that he could pay the balance on complete recovery. The actual cost of the Belt could not be more than Rs. 2. This happened in 1912.

Sargol.—A preparation for fattening people at the rate of a pound a day, sold by the Sargol Company at 124, Holborn, London, E.C. The Sargol Company is Mr. Harry Sweet, otherwise Evelyn Ellison and others.

CHAPTER XXI.

PHARMACEUTICAL PREPARATIONS.

Edited by Dr. JAGADISH MITTER.

For Flavouring Essences, Diabetic Lemonade, Lemonade Powder, Malted Milk, Coffee Extract, Throat Pastils, Malted food for Infants, Artificial Honey, Fruit Elixir Limepepsin, Humanised Milk, Disinfectants, Insecticides, Tooth Powders, Dandruff Cure, Smelling Salts, Corn Cures, Hair Restorers, Hair Tonic, Mouth Washes, etc Consult Index

N.B.—For popular names of drugs and for classification of medicines, see Part III; for Hindustanee Equivalents of Drugs, see Part IV, Directory. For English equivalents of Hindustanee drugs in English, see Part V.

The priceless recipes and prescriptions have and can form the bases of many Patent and Proprietory medicines and can be sold under fancy names. A good organisation, a super-abundance of driving power and an endless propaganda are greatly needed. For this purpose one should have either his own capital or one should enlist the co-operation of a capitalist.

Lozenges, Tablets, Wafers.—W. B. Lozenges and Tablets are made with the help of some mucilage-like gum arabic, gum tragacanth, honey, syrup, etc., as binding material. A putty like dough is made and rolled out in a flat plate with an even roller like that used in making chapatis in India, and pressing through the dough with a thimble, small opening downmost, it is cut up into lozenges. Pills are made with a pill-making machine which does not cost much. Tablets are made with a tablet-making machine—in normal times it costs not more than Rs. 125. In big cities like Lahore, Delhi, Bombay, tablets can be made by professional tablet

makers at so much a pound, the smaller the tablets the greater the charge. Wafers are sold by all respectable chemists and druggists.

Sugar coating of Pills.—Sugar-coating of pills has made the administration of bitter medicines very easy. As big pills are not easy to swallow, this being especially the case with young children and with those who are averse to taking medicine, it is advisable to make small pills. The pills to be coated should be absolutely dry, otherwise the layer of sugar will crumple and leave a shell that is easily broken.

Sugar coating of Pills is done just in the way in which *makhanas*, *elaichi danas*, or sugar-coated aniseed, is made. There must be enough of the substance to be coated. The syrup must be of ball consistency type. Place the pills of medicines, etc., over powdered sugar and starch in equal quantities in an ordinary well-burnished kettle (*karahi*). To the syrup add a little of gelatine or gum arabic. Give the kettle a circulatory motion and go on pouring syrup little by little. By adding a little fine tragacanth powder to the starch, an elegant product is obtained.

The ingredients required for coating are starch, gum arabic and sugar in equal parts. They should be reduced to a very fine state of division and well mixed in a mortar, better of porcelain or stone. Iron mortar changes the colour of the ingredients. Next best mortar is that of brass. All these ingredients, too should be absolutely dry before they are mixed. If not dry, they should be put in the sun or iron kettle like the one used by the confectioner. Put a few pills at a time in another box, and pour over them a small quantity of simple syrup of sugar just to moisten them. Remove them to the kettle containing the powders, and with the handles give it a backward and forward motion just as is done in making *elaichi danahs*, until completely coated, dry and smooth.

As the process is rather difficult during the rains, the manufacturer should lay a big store of the pills during the preceding summer.

This process is equally applicable to the manufacture of various kinds of sugar-coated fruits, as almonds,

peanuts, poppy-seeds, anise, cardamom seeds, pistachio, cocoanut slices, and parched grams.

Hygroscopic pills, especially those containing salts, should be stored in air-tight phials during the rains.

EYE, EAR, NOSE, THROAT AND MOUTH DISEASES.

Earache Drops.—Anesthesin, 5 gr. (0.325); phenol, 2 gr. (0.130); Ol. menth pip., 10 gr. (0.650); glycerine, 2 fl. dr. (8.000).

M. et-sig; Two or three drops in the ear as required for pain. Better if used warm.

Deafness, Partial Cure of.—When deafness is due to deficiency in the natural secretions of wax, or dryness of the aural passage, only mild stimulant will be found useful. For this object a little almond or olive oil, to which a few drops of oil of turpentine, oil of juniper, or camphor liniment have been added, may be applied with benefit.

Nasal Tablets.—Borax, 8 grains; eucalyptol, $\frac{1}{6}$ grain; menthol, $\frac{1}{12}$ grain; sodium benzoate, $\frac{1}{3}$ grain; sodium bicarbonate, 8 grains; sodium salicylate, $\frac{1}{3}$ grain; thymol, $\frac{1}{6}$ grain; oil of wintergreen, 1/12 minim.

Catarrh, Nasal.—Iodidi, gr. 30; pot. iodidi, gr. 40; tannic acid, dr. 1; carbolic acid, dr. 1; glycerine, oz. 1; aqua dist. q.s. ad oz. 6.

M. Sig: Use with Nebulizer in chronic catarrh, enlarged tonsils, adenoid growths and chronic laryngitis. Alterative and astringent.

Thymol Inhalation.—Thymol, 6 gr.; magnesium carbonate, 3 gr.; alcohol (20%), 10 minims; distilled water q.s., 1 oz.; mix the thymol, magnesium carbonate, and alcohol with sufficient distilled water to produce one ounce of the inhalation. Use a teaspoonful in a pint of water at 140° F. for each inhalation.

Throat Tablets for Singers and Speakers.—Citric acid powder, 4 oz.; milk sugar, 4 lb.; sugar, 6 lb.; gum acacia powder, 8 oz.; carbolic acid, 1 oz.; menthol, 1 oz.; tincture of iodine, 9 fl. oz.; solution of formaldehyde, 6 fl. oz.; simple syrup just enough. Make as formamint tablets, adding solution of carbolic acid and peppermint in the tincture of iodine just before

compressing. Dry again in a warm place. Divide into 2·5 gr. tablets.

Anti-Influenza Inhalant.—Very useful for those who easily catch cold. Menthol, oil of thyme, oil of cajuput, methyl salicylate, each one dram; oil of eucalyptus, 4 drams. *Cp. with Listerine.*

Formamint Tablets.—Citric acid, 8 oz.; milk sugar, 2 lb.; sugar, 3 lb.; gum acacia, 4 oz. Reduce to fine powder and triturate with $\frac{1}{2}$ fl. oz. of oil of peppermint and 3 fl. oz. of solution of formaldehyde. Mix syrup enough to make a dough. Divide into 1·5 gr. pilules and compress into tablets.

Canada Catarrh Cure.—Carbolic acid, 10 to 20 mm.; vaseline, 1 to 2 oz. Mix and thin with a little eucalyptus oil and alcohol. Use with an atomizer 3 or 4 times a day. An excellent remedy.

Potassium Chlorate Lozenges.—One lozenge to contain $1\frac{1}{2}$ gr. potassium chlorate. Useful for phthisis, sore throat; 6 to 12 lozenges may be taken in a day.

Influenza Cure.—Dilute hydrogen peroxide with water. Take small sips, spray the nose and throat with it. Tested by many as a never failing remedy.

Catarrh Remedy after Dr. Satches.—1 grm. carbolic acid; 1 grm. camphor; 20 grms. of common salt; dissolved in $\frac{8}{7}$ liters of water; should be injected into nostrils. If the first three be mixed with white vaseline, to which a few drops of oil of peppermint and a few drops of oil of eucalyptus have been added, something like Nostroline may be produced. Fill in collapsible tubes and advertise with the onset of winter. The inside of the nostrils should be smeared with the paste.

Cold Cure Tablets.—Divide into 3 gr. tablets. Antifebrin, 10 parts; camphor, 5 parts; podophyllum resin, $\frac{1}{4}$ part; quinine sulphate, 5 parts; simple syrup, just enough.

Sore Throat Gargle.—Dil. nitro-hydrochloric acid, $1\frac{1}{2}$ fl. dr.; syrup of orange, 1 fl. oz.; potassium chlorate, 90 gr.; water, 6 fl. oz.

Phenol Sodique.—A most useful mouth-wash, being ant-acid, astringent, a sedative, a styptic, an

antiseptic, and disinfectant. Specially beneficial in that class of cases of soft, spongy, swollen gums which bleed at the slightest touch. Used after bleeding and extraction; corrects foul breath. Take carbolic acid, 2 %; sodium sulphocarbolatis, 3% ; sodium bicarbonate, 5 %; glycerine, *aqua auranti floris*, alkal, carmin. sol. q.s.

Astringent Pigments for Sore Throat.—(1) Iron sulphate, 1 dr.; water, 1 oz. (2) Ferri perchloride, 1 dr.; water, 1 oz. (3) Zinc chloride, 15 to 30 gr.; dilute hydrochloric acid, 2 mm.; distilled water, 1 oz. (4) Tannic acid, 30 gr.; carbolic acid, 30 gr.; glycerine, 1 oz.

Antiseptic and Sedative Pigments.—(1) Carbolic acid, 20 to 30 gr.; glycerine, 1 oz. (2) Boro-glycerine, 1½ dr.; glycerine, 1 oz.

Caustics for Throat Paints.—(1) Chromic acid, 10 gr.; distilled water, 1 oz. (2) Silver nitrate, 30 to 60 gr.; distilled water, 1 oz.

Gingivitis.—Tinct. chloridi, 2 gr.; tinct. sulphatis, 2 gr.; spiritus chloroformi., 5 m.; aqua menth pip. ad ½ oz.; mix ten drops in half a tumbler of water as a mouth-wash. All tartar should be removed before using such a mouth-wash.

Mandel's Pigment.—To paint sore-throat: Iodine, 5 gr.; pot. iodide, 25 gr.; oil of peppermint, 5 drops; glycerine, 1 oz.

Chronic Laryngitis.—The following combination has been found very good for inhalation in chronic laryngitis:—

(1) Eucalyptol, 3 mm. spt. camphor, 4 dr.; tr. benzoin co., ad, 2 oz.

Mft.: Two teaspoonfuls to a pint of hot water and inhaled from 15 to 30 minutes at bed time and on arising. After the morning inhalation the patient should remain indoors for an hour or two.

(2) Menthol, 90 gr.; oleum pini sylvestins, 1 dr.; oleum eucalyptus, 1 dr.; tr. benzoin, 1 dr.; tr. tolu, 1 dr.; Mft. Inhale from a steam kettle or vaporizer.

(3) Eucalyptus oil, 20 mm.; tr. benzoin co. 30 mm.; thymol, 10 gr.; spt. chloroform, 1½ dr. Mft. Ten drops to be inhaled from an inhaler.

Nose Washes.—(1) 1 dr. each of sodium chloride pure, sodium bicarbonate, ammonium, chloride, borax, pot. chlorate, or boric acid, may be dissolved in a pint of water and sniffed up. (2) Sodium bicarbonate, sodium biboratis, 1 dram each; sodium chloride, 2 drams. Dissolve a teaspoonful in a pint of lukewarm water.

Nose Paint.—Acid salicylic, 5 gr.; sulphur precipitate, 2 dr.; paraffinum mollis, ½ oz. Useful in seborrhocic dermatitis.

Nose Lozenges.—Mix powders of cubebs, 2 drams, and balsam of tolu, 6 gr. Then add extract of liquorice, 1 oz; syrup of tolu, 1 dr.; gum sufficient, make 10 gr. lozenges. Suck slowly one lozenge; *will relieve obstruction in the nose during a bad cold.*

Menthol Snuff.—Menthol, 30 gr.; camphor, 30 gr.; boric acid powder, 1 oz., lycopodium, 1 oz.

Medicated Snuff for Madrassis.—Mix the above ingredients with 8 to 14 oz. of Peshawari snuff.

Teething.—The following solution, rubbed on the child's gums, will give much relief from the discomfort incident to teething: anesthesin, ½ dr.; phenol, 3 mm.; tr. iodi, 10 mm.; alcohol 6 dr.; glycerine, q.s. add 1 oz.

For Dental Neuralgia.—Tr. opii, ½ dr.; chloroform, ½ dr.; creosoti puri, ½ dr.; tr. benzoin co., 1 dr. *Mft.* Tinct to be applied to the cavity of the tooth on cotton wool.

Toothache Remedies.—(1) Acetic ether, 2; chloroform, 1; creosote, 1. (2) Menthol, 8; chloroform, 8; alcohol, 84. (3) Liquor ammonia (0.890—0.885), 1; 90% alcohol, 3 to 4. Add a little oil of cloves or *cajuput.*

Toothache Drops.—(4) Chloroform, 2; alcohol 21; menthol to mask the odour. (5) Saturate 4 oz. of alum powder in 1 lb. of sweet spirits of nitre. Filter and bottle. Cork well. (6) Creosote, 2; 90% alcohol, 2; oil of cloves, 3.

Pills or Paste for Toothache.—Opium, 12 grs.; camphor, 24 grs.; cajuput oil, 4 drops; extract of henbane and of belladona, each 25 grs.; distilled water of opium q.s.

Pyrrhoea Specific.—According to a writer in the *Arorbans Sudharak* the following is sure and speedy cure for pyrrhœa, a disease which attacks the gums and produces bleeding, suppuration and foul breath.

Place 2 oz. of alum in a big iron basin or vessel. Heat it moderately. Take a bottle of good vinegar and pour the liquid drop by drop till the whole has been used. Take the vessel off the fire. Now place over the alum the rind of four soap nuts. Cover with an earthen vessel and again heat it. A short time after the rind will be reduced to cinder. Take off the fire and reduce the contents to a fine powder. Use as toothpowder. Beneficial for loose teeth also.

Voice Tonic.—Tannic Acid, 60 grains; glycerine of borax, 6 fl. drs.; glycerine of phenol, 20 mm.; sweet solution of roses, 2 fl. dr.; distilled water, sufficient quantity to produce, 6 fl. oz.

Breath-Sweetening Lozenges.—Essential oil of cloves, 1; sugar, 128. Carminative, stomachic, restorative after fatigue. By adding to chocolate its taste is improved.

DISEASES OF DIGESTIVE SYSTEM.

Stomachic Elixir.—Crush 66 parts of gentian root, 33 of orange rind free from white skin, 5 of white cinnamon and 2 of cochineal. Place in a glass decanter and pour over it 1250 parts of rectified spirit. Let digest for 4 days. Strain through a cloth and filter.

Stomachic Tablets.—Bismuth subnitrate, 3 gr.; powdered rhubarb, 1 gr.; sodium bicarbonate, 2 gr.; powdered ginger, 1 gr.

Digestive Tablets.—Ginger, in powder, 60 grains; heavy magnesium carbonate, 600 grains; rhubarb root in powder, 30 grains; simple basis, sufficient quantity. Mix and divide into 60 tablets.

Indigestion Tablets.—Ginger root powder, 2 oz.; ipecacuanha root powder, $\frac{1}{4}$ oz.; sodium bicarbonate, 8 oz.; extract of nux vomica, $\frac{1}{4}$ oz.; extract of rhubarb, 1 oz.; extract of gentian, 2 oz.; simple syrup just enough. Divide into 3 gr. tablets.

Indigestion Mixture.—Sodium bicarbonate, 90 grains; aromatic spirit of ammonia, 3 fl. dr.; compound

tincture of gentian, 6 fl. drs.; distilled water to make 8 fl. ounces. *Dose:* $\frac{1}{2}$ to 1 fluid ounce.

Clarke's Mixture for Diarrhœa.—Acid sulph. arom, $\frac{1}{3}$ oz.; spt. ether, $\frac{1}{2}$ oz.; tinct. chlor. co., 1 oz.; tinct. camphor, $1\frac{1}{2}$ oz.; sp. menth. pip., 3 dr.; ext. haematoxyli, 4 dr.; aqua camphor, add 12 oz.

M. Sig:—One ounce for the first dose and half ounce every two, three or four hours afterwards according to the urgency of the diarrhœa.

Digestive Tonic.—Ammonium carbonate, 20 grains; potassium bicarbonate, 20 grains; rhubarb root in powder, 20 grains; spirit of chloroform, $1\frac{3}{4}$ fl. dr.; peppermint water, 8 fl. oz.

Carminative Lozenges.—Best dry ginger without fibres, 1 oz.; gum arabic, 1 oz.; double refined sugar or *boora*, 2 lb., rose water coloured with fine grains of sufficient saffron. Make suitable lozenges. By using essence of ginger instead of ginger, finer lozenges can be made. Carminative, stomachic, anti-flatulent, appetizer.

Sulemani Salt.—Pulverise rock salt, sambhar salt, black salt, *Kanwar Gandal*, one tola each, in lemon juice and add the following in fine powder: sal ammonia, mooli Khar, borax burnt, pepper, asafœtida, myrobolan, harar, dil seeds, ginger dry, 2 tolas each. *For indigestion, stomachache, colic, pain from cold, scorpion poison, spleen, malaria, dysentery, irregular menses.* An excellent Indian preparation. If taken immediately when a person feels chill, it will prevent malarial fever. *Dose:* Upto 2 mashas (2 grams).

Digestive Tonic.—Ammonium carbonate, 20 grains; potassium bicarbonate, 90 grains; rhubarb root, in powder, 20 grains; spirit of chloroform, 2 fl. drs.; peppermint water to add 8 fl. ozs. *Dose*: One fluid ounce thrice daily.

Charcoal Lozenges.—Prepared charcoal, 1; sugar, 3. Gum mucilage sufficient. Useful for diarrhœa, cholera, dyspepsia.

Catechu Lozenges.—Extract of Catechu, 4 oz.; sugar, 10 oz.; gum tragacanth mucilage sufficient. Turn into 10 gr. lozenges. *Useful for diarrhoea, relaxed uvula, laryngial irritation, foul breath.*

Cholera Pills.—According to a writer in *Jiwan Tat* for 16th August 1927, the following pills if used in the early stage are attended with 95% success. Take equal quantities of seeds of chillies, asafœtida (*heeng*), ginger (*sonth*), camphor, opium. Grind them in an equal quantity of juice of onions, and form pills two grains each. Administer pills with a little water.

Dysentery.—Beta-naphthol, 5 gr.; olive oil, 1 dr.; oil cinnamon, 1 mm.; mucilage q.s.; aqua menth. pip, add 1 oz. Mix. Use thrice daily.

Dysentery and Diarrhœa.—Grey powder, 1 dr.; pulv. cretæ arom, 11 dr. Mix. *Dose:* 6 to 12 gr.; 3 or 4 times daily for a child 2 to 4 years old.

Chlorodyne.—A preparation much used for colic and cholera : Hydrochloride of morphia, 8 gr.; chloroform, 96 drops; rectified ether, 64 drops; rectified spirit, 64 drops; dilute hydrocyanic acid, 64 drops; tincture of Indian hemp (*bhang*), 64 drops; tincture of capsicum, 48 drops; oil of peppermint, 6 drops; hydrochloric acid pure, 8 drops; powdered tragacanth, 4 gr.; dark green molasses, 6 dr; distilled water to make 2 oz. Freeman's chlorodyne is much popular in India.

Laxative Herbal Tablets.—Extract of cascara sagrada, 2 gr.; extract of dandelion, ½ gr.; extract of socotrine aloes, ½ gr.; oil of peppermint, ⅛ mm. Make one tablet.

Laxative Elixir.—Liquid extract of cascara sagrada, 2 fl. ounces; liquid extract of liquorice, 1 fl. ounce; syrup of ginger, 1 fl. ounce. *Dose:* ½ to 1 fluid drachm.

Aperient Senna Syrup.—(1) Senna leaves, 7 oz.; bruised fennel seeds, 2½ oz. Boiling water 20 oz. Soften by soaking for 6 hours. Strain through linen. Dissolve in the solution, 3 oz. of manna. Add this to 3 lb. of molasses, previously boiled down to the consistency of sugar-candy. Stir well. *Dose* : 1 to 4 dr. Gur or molasses is a mild aperient. The older the molasses, the bitterer it becomes and on account of the sugar being inverted tends to become more and more cathartic.

(2) Soak one chhtk. of senna leaves with half as much tamarind for 2 hours in water. Rub, strain, mix $\frac{1}{2}$ chhtk. sugar. To be taken twice at interval of two hours. A very refreshing aperient.

Vegetable Aperient Pills.—Barbadoes aloes, 4 parts; ginger, 2 parts; gamboge, 1 part; oil of caraway, 1/16 part; oil of fennel, 11/6 parts.

Laxative Confection.—$\frac{1}{2}$ lb. prunes; $\frac{1}{2}$ lb. damarara sugar; 1 oz. ground senna, $\frac{1}{2}$ oz. ground ginger.

Cover the prunes with water and stew with the sugar gently until soft, *i.e.*, for $1\frac{1}{2}$ to 2 hours. Put through a hair sieve and mix thoroughly with senna and ginger. Keep covered in a dry place.

Dose: One teaspoonful more or less at bed time.

A Prescription of Worth.—Magnesia carbonate, 1 oz.; rhubarb powder, 1 oz.; sugar powder, 2 oz.; soda bicarbonate, 4 oz.; oil peppermint, 30 mm.

M. ft. Mix Sig. One half to one teaspoonful in water as indicated.

It is of great value in many systematic conditions as well as an adjunct to most chronic conditions. It is an anti-acid, anti-fermentative, neutralizing, a mild laxative, anti-spasmodic. It relieves abdominal flatulence.

In digestive disturbances of the bottle fed baby of all ages, especially the old, it is ideal. In pyrosis it is almost a specific. In infantile colic it works a miracle, and in all acute diseases that have an acidosis tendency.

Heartburn Tablets.—Diastase, 25 parts; pancreatin, 25 parts; papain, 50 parts; bismuth carbonate, 200; heavy mag. carbonate, 1800 parts; oil of cinnamon, oil of coriander, white sugar, of each a sufficient quantity to make a suitable lozenge.

Syrup of Figs.—Figs (finely chopped), 8 oz.; dates without seeds (chopped), 4 oz.; buckthorn bark powdered, 8 oz.; senna leaves (cut or bruised), 8 oz.; cascara bark, powdered, 8 oz.; bicarbonate of sodium, 1 oz.; rochelle salts, 4 oz.; sugar, 6 lb.; oil of anise, 15 mm.;

oil of peppermint, 15 mm.; oil of cloves, 10 mm.; alcohol. 29 fl. oz., ; water, q.s. *A tonic laxative.*

Antacid Tablets.—Heavy magnesium carbonate, 5 oz.; precipitated chalk, 7 oz.; sodium chloride, 2 oz.; simple syrup just enough. Mix to a slightly damp powder. Pass through a 20-hole sieve. Dry. Divide into 15 gr. pilules and compress with a tablet-making machine.

Cirrhosis of Liver.—In case of cirrhosis of liver accompanied with ascites, Dr. G. L. Saxcna, Partapgarh, after tapping the ascites has found the following combinations with a fair percentage of success :—

1. Ammonium chloride, 10 gr.; sodium iodide, 3 to 5 gr.; ext. apocyanum liquid, 10 mm.; tr. digitalis, 5 to 10 m.; tr. scillae, 15 mm.; aqua, add 1 oz.

Fait mustura—dose one; *Sig*. Thrice daily.

2. Resin podophyllum, 1-5 gr.; ext. alces, 1 gr.; pulv. ipecac., $\frac{1}{2}$ gr.; ext. nux vomica, $\frac{1}{4}$ gr.; ext. gentian, 1 gr.

Mft. pill one. *Sig*—one such pill to be taken every night at the time of retiring for one week; thereafter, on alternate nights for another week, and then twice weekly.

N.B.—Aqua solanum nigram is given to the patient in place of water, and common salt is withdrawn from food.

Liver Mixture.—Magnesium sulphate, 180 grains; sodium sulphate, 180 gr.; diluted sulphuric acid, 90 minims; syrup of cochineal, 4 fl. drs., chloroform water, a sufficient quantity to produce 6 fl. oz. Mix. *Dose:* 2 to 4 fluid drachms.

Liver Pills.—Barbadoes aloes, 1 ounce; exsiccated ferrous sulphate, 2 ounces; myrrh, 1 ounce; extract of gentian, 2 ounces; mix to form a mass.

Torpid Liver.—Thickened bile with pain: sodi salicylas (nat), 5 gr.; sodi bicarb, 15 gr.; sodi benzoas, 5 gr.; sodi sulph, 1 dr.; tr. belladona, 5 mm.; syr. rosae, $\frac{1}{2}$ dr.; aqua chloroform ad 1 oz. 1 mixt use thrice daily.

Kidney and Liver Pills.—Cape aloes in powder, 2 oz.; gamboge in powder, 1 oz.; ginger in powder,

$\frac{1}{4}$ oz.; jalap in powder, $\frac{1}{2}$ oz.; hard soap in powder, $\frac{1}{4}$ oz.; oil of cloves, 27 minims.

Excipient, a sufficient quantity. *Dose:* 4 to 8 grains.

Antibilious Pills.—(1) Capsicum (in powder), 3 grains; compound extract of colocynth, 24 grains; hyoscyamus, 12 grains; ipecacuanha root in powder, 3 grains; mercury pill, 18 grains; mix to form mass. *Dose;* 3 to 6 grains.

(2) Barbadoes (in powder), 9 ounces; mercurous chloride, 5 ounces; rhubarb root (in powder), 9 ounces; hard soap (in powder), oil of cloves, syrup sufficient quantity. Mix to form a mass. *Dose* 4 to 8 grains.

Headache and Neuralgia Tablets.—Caffeine, 4 oz.; phenacetin, 4 oz.; quinine hydrobromide, 3 oz.; simple syrup just enough. Make 5 gr. tablets.

Piles, Never-failing Remedy for.—Make a stiff paste of confection of senna, 2 oz.; cream of tartar, 1 oz.; flowers of sulphur, 1 oz.; ginger syrup enough. Take a pill as big as a walnut whenever the bowels are constipated. Excellent.

For Piles.—(*a*) Ext. stramonii, $\frac{1}{2}$ gr.; ac. tannic, $\frac{1}{2}$ gr.; plumbi carbonate, 1 gr.; sol. plumbi acet. dil. 2 mm.; creosote, $\frac{1}{2}$ mm.

M. ft. Suppository. One two or three times a day.

(*b*) Chrysarobin, $1\frac{1}{3}$ gr.; iodoform, $\frac{1}{3}$ gr.; ext. belladonaæ, $\frac{1}{6}$ gr.; butter cocao, 30 gr.

M. ft. Suppository. One or two three times a day.

(*c*) Bismuth oxychlor, $1\frac{1}{2}$ gr.; tinc oxydat, $2\frac{1}{2}$ gr.; sol. adrenalin, 1 mm.; eucain hydrochl., 1 gr.; menthol, $\frac{1}{2}$ gr.; butter cacao, 30 gr.

M. ft. Suppository. One morning and one evening.

Worm Lozenges.—Each lozenge should contain 1 gr. of calomel. While prescribing, warn against use of salt food, acid, liquors, and sugary articles. A few hours after taking the lozenges a purgative should be given.

Children's Worm Powder.—Jalapin, 1 oz.; mercurous chloride, 1 oz.; sachharin, 2 grains; santonin,

2 oz.; oil of cloves 5 minims. *Dose*: 2 to 4 grains once only. It is a poison. Use cautiously. Label: Poison.

Worm Lozenges for Children.—With the following make 1,000 lozenges. Santonin, 1000 gr.; calomel, 700 gr.; powdered sugar, 1 lb. powdered gum arabic, 600 gr.; mucilage of acacia, 2 fl. oz.; tincture of orange, 1 fl. oz.; distilled water just enough to make dough. Triturate thoroughly. *Dose*: 1 lozenge.

Tapeworm Cure.—Let the patient forego 2 meals successively, and then take 2 teaspoonfuls of Kamala (Hindi, Kameela). Should the bowels still remain inactive, give another teaspoonful of Kameela. Then $2\frac{1}{2}$ hours later, give a dose of 1/2 to 1 oz. of castor oil according to age and according to stiffness of bowels.

N.B.—Kameela is of brick red colour and is almost tasteless. Fraudulent suppliers mix brick powder with Kameela.

Dropsy Drops.—Crushed juniper berries, 1 oz.; mustard seeds, 10 oz.; crushed horse raddish, 1 oz.; parsley root, 2 oz.; good old cider, 40 oz. Steep in cider. *Dose*: One wineglassful thrice daily.

Colic Balsam.—For children. Triturate in a glass or porcelain *Kharal* nutmeg oil, 100; oil of cloves, 12; oil of lavender, 12; oil of amber, 4; black Peruvian balsam, 18. Rub on the stomach.

Grey Powders.—Calomel, 1 part; milk sugar, 2 parts; liquorice root powder free from fibres, 3 parts. Pack in 2 to 6 gr. packets.

Children's Powders.—Aperient. Cooling. Fever or Teething Powder. Calomel, 1 part; magnesium carbonate, 1 part; milk sugar, 2 parts. Divide into 2 to 6 gr. powder.

Gripe Water for Children.—(1) Sodium bicarbonate, 2 gr.; tincture cardamoms compound, 5 drops; spirit of camphor, 1 drop; spirit of sal volatile, 2 drops; syrup of ginger, 5 drops; anise water to make 1 fl. dr. *Dose*: 1 fl. dr. for a child under twelve months old.

(2) Sodium Bicarbonate, 2 gr.; ammonium carbonate, $\frac{1}{4}$ gr.; compound tincture of cardamoms, 5 mm; compound syrup of rhubarb, 10 mm.; distilled water, 1 fl. dr.

(3) Light carbonate of magnesia, 2 gr.; sodium bicarbonate, 1 gr.; spirit of chloroform, 1 mm.; glycerine, 5 mm.; peppermint water, 1 fl. dr.

Gripe waters are generally very mild alkaline mixtures with carminatives, intended for the minor stomach disorders of children.

Round-worms.—Santonin, gr. 2. Hydrarg chlor. mit. gr. 1 Theobromatis gr. 30. M. et. pt. trochis No. 2.

Sig : One lozenge night and morning for round-worms of children of two to three years. If bowels do not move in two hours after the last dose, then give a teaspoonful of syrup of senna.

FEVERS

Malaria.—Quin. sulph., 5 gr.; acid, sulp. dil., 10 mm.; tinct. fer. perchlor., 6 mm.; mag. sulph., 1 dr.; syr. lemon., 1 dr.; aq. add 1 oz.

Sig. Two tablespoonfuls three times a day.

Ague Mixture.—Dissolve 20 gr. in 1 dr. of sulphuric acid and 14 mm. of tincture coborh. *Dose*: 20 mm. in half a wineglass every one hour.

Iodine and Carbolic Acid Mixture in Typhoid.—Acid carbolici, 2 mm.; Tr. iodi, m.; Tr. aurantii., $1\frac{1}{2}$ dr.; Syrup, 3 dr.; aqua add 8 oz. *Mft. mist.*

Sig. Two tablespoonfuls every four hours.

Chlorine Mixture in Typhoid.—Pot. chloras, 200 gr.; acid muriatic (strong) 240 mm.; Quinine murias, 24 gr.; syr. lemonis, 1 oz.; aqua, add 12 oz. *Dose*: 1 oz. every four hours.

N.B.—The water should be added gradually and the bottle frequently shaken to dissolve chlorine gas.

2. For Diarrhœa of Typhoid.—Acid sulphuric aromatic, 15 mm.; Tr. opii. 10 mm.; Tr. catechu, 20 mm.; Aq. chloroform, add 1 oz.

Mft. mist. Thrice daily.

3. For Hœmorrhage of Typhoid.—Acid tannic, 10 gr.; tr. opii,. 10 m.; spt. terebinth, 15 mm.; mucilage, 2 dr.; tinct chloroform co., 20 mm.; Aq. menth. pip., 1 oz.

Sig. To be taken every four hours. No food except milk and that only when hœmorrhage stops.

4. For Sleeplessness in Typhoid.—Liquor morphine hydrochlor, 1 dr.; sodi. bromide, 45 gr.; Syr. aurantii, 3 dr.; Aq. chloroform, add 2 oz.

Sig. Half to be taken at bed time and remainder in 3 hours, if necessary.

SALINE LAXATIVES.

Citrate of Magnesia.—It is an excellent laxative. 2 to 4 drams may be taken in soda water. To fill 12 bottles take 4 oz. of magnesium carbonate, 8 of citric acid, 12 of sugar, and 9 pints of water. Add essence of lemon to flavour. Dissolve and filter and bottle at once up to shoulders. To each bottle add 30 gr. of pot. hydrogen carbonate.

Seidlitz Powder.—(Aperient.) Enclose in blue packet potassic-tartarate of soda (Rochele salts), 2 dr.; bicarbonate of soda, 40 gr. Mix. In white paper, enclose tartaric acid, 35 gr.

Lemonated Seidlitz Powder.—Very agreeable and highly appreciated. Dry on separate plates or papers fine powders of tartarated soda, 24; bicarbonate of soda, 8; tartaric acid, 7; white sugar, 32. For drying a little gentle heat may be employed. Rub $\frac{1}{8}$ part of essence of lemon with sugar with a pestle and mortar and sieve. Add tartarated soda and bicarbonate of soda. Mix well. Then mix tartaric acid thoroughly. Sieve once or twice and store in perfectly clean dry and well-corked bottles. Seal if not required immediately or the mixture may be spoiled. *Dose*: 1 dessertspoonful in a tumbler of spring water.

Bisurated Magnesia.—Made as above. Bismuth carbonate, 1 oz.; sod. bicarbonate, 5 oz.; magnesium carbonate, heavy, 6 oz.; simple syrup, just enough. Divide into 15 gr. pilules.

Neutral Citrate of Magnesia.—Free from impurities and harmful excess of citric acid—a tasteless neutral powder of dull white colour, soluble in double as much boiling water. Dissolve 100 parts of citric acid in 300 of boiling distilled water. Add slowly about 70 parts of basic carbonate of magnesium, leaving a little excess of acid as tested by litmus paper. Filter even as warm and store in a dry place when in about 24 hours the mass solidifies, when it should be broken

in small pieces, dried at a temperature of 70° to 75° F., on a sand bath and powdered.

Fruit Salt.—(*a*) Sodium bicarbonate, 51 ; crystals of tartaric acid, 27 ; citric acid, 18. Heat together in a china dish, until granular. Bottle at once. Stopper securely. (*b*) Take equal quantities by weight of bicarbonate of soda, tartaric acid, cream of tartar, epsom salts and sifted sugar. Dry the salts in an oven and triturate them finely. Then mix the whole well together and keep in a dry place. While bottling, see that the corks are air-tight, otherwise moisture will spoil the effervescent properties of the salt. (*c*) Bicarbonate. of soda ; fine white sugar ; powdered juniper ; citric acid. Take equal quantities. Excellent for indigestion. An excellent drink.

Citric Acid.—Citric acid is got chiefly from limes, lemons, bergamot, oranges, etc., of the citron family. The juice is pressed out by means of a squeezer, heated to boiling point so that 10 per cent. of it is left and then is run in with a mixture of chalk and water to form calcium citrate which is allowed to precipitate. The precipitate is filtered and washed and treated with sulphuric acid when calcium sulphate or gypsum is precipitated and the supernatant solution of citric acid is syphoned off and boiled to make crystals.

DISEASES OF AIR PASSAGES,

Aniseed Cough Balsam.—Liquid extract of ipecacuanha, ½ part ; oil of anise, ½ part ; paregoric, 16 parts ; syrup of tolu, 24 parts; caramel, 4 parts ; oxymel of squill, 80 parts. *Dose* : One teaspoonful four times a day.

Opium Lozenges.—Opium, 2 dr. ; tincture of tolu, 1½ oz. Mix well. Add refined sugar powder, 6 oz. ; extract liquorice, 5 oz. ; gum arabic, 5 oz. Triturate. Cut up in 10 gr. lozenges. Useful for tickling cough and irritation of the voice box ; anodyne ; hypnotic.

Cough Lozenges.—Make a mucilage of the consistency of thin molasses by dissolving liquorice in water. Mix with the dough made gum water and sugar. Also make a solution of ipecacuanha, 2 oz. ; morphine (acetate of morphia), 1 dr. ; oil of aniseed, 1 oz. ; fine powder of tartaric acid, 1 oz. Mix well all.

Cough Cure.—Tincture aconites, 15 mm.; tincture ascelpia, $1\frac{1}{2}$ dr.; glycerine 2 oz.; syrup of wild cherry, 2 oz. Stir well together. *Dose*: 1 teaspoonful every 40 mts. until cured.

Balsam for the Lungs.—Liquid extract of ipecacuanha, 1 oz.; liquid extract of squills, 2 oz.; Chloroform, $\frac{1}{2}$ oz.; wine of tar, 2 oz.; tincture opium, $\frac{2}{5}$ oz.; fluid extract of mullen, 2 oz.; syrup enough to make 2 pints.

Gold Lozenges.—For one lozenge take $\frac{1}{40}$ gr. of neutral chloride of gold. Excipient sufficient. Useful for scrofula cancer. *Dose*: 2 to 4 daily.

Hiccough.—1. Soddii bicarb., 15 grs.; spt. ætheris, 10 m.; tr. card. co., 10 mm.; aqua choloroform add. 1 oz. mft. misi 6 such; one every three hours. Mustard plaster over the stomach. Thin barley water to drink.

2. Pine-apple leaf (soft part) well contused, 4 dr.; white sandalwood, well bruised; 4 dr.; husked sesame seed, 4 dr.; husked black pulse powder, 4 dr. Mix together 4 to a dr.; smoked at time as a cigarette or in any other form, every three to four hours or oftener, according to the severity of the case. It will cure all kinds of hiccough generally within 2 to 4 hours.

Croup Syrup.—Boil 1 oz. of squills, 1 oz. of seneca snake root in 1 pt. of water. Evaporate one half strain, mix honey 1 lb. with 24 gr. of tartrate of antimony. *Dose* for a child: 10 mm. to 1 teaspoonful.

Bronchial Asthma.—Lt. Col. Dr. R. N. Chopra, I.M.S., recommends ruth rost in the treatment of bronchial asthma. He says it relaxes the inflammatory muscle fibres of the bronchioles and relieves the congestion of the bronchial mucosa. Its depressant action on the central nervous system helps in returning the spasm.

These factors account for the rapid effect produced by the drug in cutting short the paroxysm and stopping further attacks when the drug is administered. The following mixture is recommended.

Pot. iodide or pot. bromide, 5 to 10 grs.; tinct belladonæ, 3 to 5 grs.; borax, 2 gr.; Ext. Sanssurea lappa liqd (ruth rost), $\frac{1}{2}$ to 1 dr.; spt chloroform, 10 mm.; aqua add 1 oz.

Asthma Cigarettes.—(*a*) Soak cartridge paper in nitre solution; dry and sprinkle over simple tincture of benzoic. Turn into cigarette tubes which fill with the following: *dhatura* leaves, 4; *lobella* leaves, 2; powdered cubebs and anise, $\frac{1}{4}$ each.

(*b*) Tobacco, 90 gms.; extract of stramonium, 5 gms.; iodide of potasium, 5 gms.; nitrate of potassium, 5 gms.; alcohol, 45 gms. Mix, dry and make a hundred cigarettes in rice paper obtainable from the market.

Asthma Pastils.—Take powdered *dhatura* leaves and nitre, each 600 parts and powdered *althea* 750. Turn into pastils with the help of gum tragacanth solution. Fumes of these pastils give much relief in asthma.

Asthma Cures.—1. Take the leaves, seeds, roots and branches and all of the *puthkanda* plant, a shrub which grows wildly and widely in every part of India. Remove the dust attaching to it. Let the whole thing dry in shade. Put the dried substance in an earthen jug and cover it airtight with a lid. Fire the jug so that *puthkanda* is reduced to ashes. Mix the ashes with equal quantity of best *desi* sugar. One tola of the mixture should be taken with a little water every morning and evening. Repeat for a whole week.

2. Take one tola of pure honey every morning and evening. If unpleasant dryness be felt, 3 mashas of oil of almonds may also be mixed.

3. Take 2 grains of quinine sulphas three times a day.

4. Smokers should take $\frac{2}{3}$ tolas of *isabgol* (fleewort) with water every morning and evening.

PRIVATE DISEASES.

Leucorrhœa Cure.—Leucorrhœa does not and cannot yield to mere external treatment; the general health of the patient ought to be improved by regular nourishing diet which under the present state of affairs is not possible. Anyhow the following is excellent for local application: Tannic acid, 1 oz.; glycerine,

4 oz. Dissolve the former in the latter by gentle heat. Add one teaspoonful to a pint of water. Inject twice with a syringe.

Dismenorrhoea.—1. Sod. brom, 5; gr. sp. amm. arom. 15; mm. liq. abroma et. pulsatilla co., 1 dr.; Tr. hyoscyami, 20 mm.; spt. chloroform, 10 mm.; aqua add 1. oz.

2. Phenalgin, 5 gr.; liq. abroma et pulsatilla, 1 dr.; caffeine, 2 gr.; Aq. chloroform, add 1. oz.

M. One dose. *Sig.* To be taken every three hours till pain is relieved.

Pain in Dysmenorrhœa.—For the relief of pain during the flow, all the coal-tar products are useful. It is found that the following prescription gives great relief in many cases; phenazone, 10 gr.; sp. ammonia armatic co., 15 mm.; sp. menth., 10 mm; sp. chloroform, 10 mm.; aqua add ½ oz. A dose to be taken every three hours for three days.

Spermatorrhœa.—Pulv. opii., 5; gr. pulv. acacia syr. simple add q.s. to make a mass.

M. Divide into 40. pills. *Sig.* Two pills thrice daily.

Gonorrhœa.—Soda citras, 12 gr. tinct. pulsatilla, 3 mm.; Spt. Eth., 15 mm.; Ext. kana kana, 15 m. aqua ad 1 oz. Three times a day.

Nesbit's Specific for Gonorrhœa.—Oil of copaiba, 4 fl. dr.; oil of sandalwood, 12 fl. dr.; oil of cassia, 1 fl. dr.; oil of pimento, 1 fl. dr.; rectified spirit to make 8 fl. oz.

Dysmenrrhœa.—(1) Tinct. gelsemii, 3 dr.

tinct. cardamom co. q.s. add 3 oz. M.ft. mist.

Sig. 1 dr. to be taken 3 times a day and night.

(2) Triphenin 3 gr.; ergotin 1½; gr. ft. tabs. Caps. No. 20.

Sig. One capsule every two hours.

Sig. :—Dr. 1. to be taken 3 times a day and night.

Cure for Self-abuse or Masturbation.—Liquid extract salix nigra. *Dose* : One teaspoonful thrice daily.

Treatment of Abortion.—Highly recommended by Dr. Kidar Nath Das, M.D., C.I.E., well known obstetrician and genecologist of Calcutta. To put in his words : " When you are not sure of the cause of abortions and when you cannot find out any organic lesion you can use the following prescription which has rarely failed me."

Pot. chloras, 10 gr. ; tinct. ferri perchlor. 10 mm. ; glycerine 1 oz. ; aleteris cordial add. 1 oz. . Thrice daily when abortion, is threatened, or expected.

Misce. Capiat cochlear omnis trihoris.

Backache and Kidney Mixture.—Potassium bicarbonate, 120 gr. ; potassium nitrate, 60 gr. ; tincture of hyoscyamus, 4 fl. dr. ; conc. infusion of buchu, 1 fl. oz. Water add. 8 fl. oz.

Kidney and Liver Pills.—Cape aloe, in powder, 2 oz. ; gamboge in powder 1 oz. ; ginger, in powder, $\frac{1}{4}$ oz. ; jalap in powder, $\frac{1}{2}$ oz. ; hard soap in powder, $\frac{1}{4}$ oz. ; oil of cloves, 27 mm. Excipient a sufficient quantity. *Dose* : 4 to 8 gr.

Lumbago Drops.—Copaiba, 6 fl. oz ; oil of juniper, 3 fl. oz ; solution of potash, 4 fl. oz ; spirit of nitrous ether, 6 fl. oz. Mix. *Dose* : 10 to 80 mm.

Gout.—Pot. cit., $\frac{1}{2}$ dr. ; spt. aether nitros, 1 dr. ; liq. ammon acetate, $\frac{1}{2}$ oz. ; aqua add 2 oz.

M. Sig. In a tumblerful of water 3 times a day.

Gout and Rheumatic Mixture.—Potassium bicarbonate, 120 gr. ; potassium, iodide 30 grs. ; colchicum wine, 2 fl. dr. ; tincture of orange, 2 fl. dr. ; distilled waters, sufficient quantity to produce 6 fl. oz. *Dose* : 2 to 4 fl. dr.

Gout and Rheumatism Tablets.—Capsicum powder, 1 oz.; quinine salicylate, 5 oz.; extract colchicum, powder, 2 oz. ; simple syrup just enough. Divide into 4 gr. tablets.

MANUFACTURE OF TONICS.

When milk and ghee were plentiful, and wheat was sold a maund for a rupee, and before the cares, anxieties and miseries had not waxed so large, as in these days of gilded poverty, the Indians required hardly any tonics, but since the advent of the Europeans, fashionable vices have eaten into our vitals, and we spend more and more on outward show than on what can support and strengthen our life ; our power of resistance has greatly been reduced and we stand every day in need of tonics. The quack doctors are making the most of this. To them a golden opportunity, and not infrequently, they offer absolutely worthless medicines which not only rob people of their money but do them little or no good. Therefore, there is a vast field for the manufacture of genuine tonics, and anyone who can be steadily and persistently honest in his business can build up a huge fortune.

Tonics are medicines to increase the tone of the muscles. Their continued use strengthens the system. They should never be given in high fever when the pulse is hard, or when the stomach is irritable and the tongue foul. Look to the bowels of the patient before prescribing any tonics.

The best natural tonics are easily digestible ; plain, homely, nourishing food, bracing countryside, seaside, or hill-side air ; moderate exercise, including brisk walk in the morning and evening ; a cheerful temper ; jolly company ; freedom from cares and anxieties ; constant occupation, short of exhaustion. 'Laugh and be fat,' is not a trite saying. There are, however, certain conditions when the body is so run down that to tide over the depression the use of tonics becomes an absolute necessity, *e.g.*, after exhausting diseases, sudden grief or mental or physical over-strain, or during the course of spermatorrhœa or night discharges, or after excessive coitus.

1. *Digestive Tonic.*—Aromatic spirit of ammonia, 2 dr. ; tincture gentian co., 3 dr. ; tincture ginger, 3 dr. ; tincture cardamoms, 6 dr. ; water 3 oz. Dose : $\frac{1}{2}$ oz. before meals.

2. *For Bloodless People.*—Tincture of perchloride of iron, 3 dr.; glycerine, 1 oz; water, 8 oz. *Dose:* 1 tablespoonful twice daily after meals.

3. *For Dyspeptics.*—Tincture cinnamon, 3 dr., syrup of orange peel 6 dr.; infusion of columba, 6 oz. *Dose*, 2 table spoonfuls every 4 hours.

4. *For Weakness with Constipation.*—Tincture of perchloride of iron, 3 dr.; tincture nux vomica, 1½ dr.; glycerine, ¾ oz.; water, 6 oz. *Dose*: 1 tablespoonful in 1 oz. of water twice daily after meals.

5. *Appetiser, Restorative after Exhausting Disease:* —Sulphate of quinine, 16 gr.; tincture of chloride of iron, 3 dr.; infusion of quassia to make 8 oz. *Dose*, 1 table spoonful in 1 oz. of water twice after meals.

6. *For Bloodless Females with suppressed menses*:—Iron sulphate (*kasees*), ½ dr.; sub-carbonate of potash, 30 gr.; myrrh (*murmaki*) powder, 1 dr.; aloes powder ½ dr. Rub together and make 30 pills. One pill after food.

7. *Strengthening.*—Kernal of tamarind seeds, 3 tolas; gum tragacanth, 1 t.; *tabasheer* (bamboopith), 2 t.; cardamom white, 2 t.; *borada* eaesabgol, 3 t.; saleb misri, 2 t.; shaqaqal, 2 t.; *Khurfa* seeds, 1 t.; pumpkin seeds, 1 t.; sugar-candy, 3 t.; *kushta rang* (tin oxide), ½ t. *Dose:* 5 mashas with cow milk early in the morning.

8. *In Spermatorrhoea and Night Discharges*.—*Gokhru* seeds, talmakhana, *asgandh*, stawar, *moosli*, *kaunch* seeds, liquorice root (*mulethi*), *nag bala*,, 4 tolas each. Powder finely. Boil the medicines in 228 tolas of cow milk. Add 36 tolas ghee. Thicken like pudding. Add 72 tolas of sugar. Preserve in a tin. *Dose* : 2 to 4 tolas in the morning. To remove constipation, a little *gulquand* (confection of roses) may be taken at night.

9. *Aphrodisiac, Semen-strengthening.*—*Mochras*, *Saleb Misri*, *moosli* black and white, almond seeds, 15 mashas each; stawar, 2½ t.; dry ginger, betelroot, 1½ t. each; raisins, ½ seer; sugar, 1 seer. Make a confection. *Dose*: 2 to 3 t. with milk in which dates, fresh or dry, have been boiled.

10. *To Redden the Complexion.*—Boil 15 mashas of *asgand* powder in one seer of milk. Add 3 tolas of sugar. Take morning and evening.

Easton's Tonic Pills.—Iron phosphate, 160 grains; quinine phosphate, 120 grains; strychnine, 5 grains; compound acacia powder and syrup of glucose of each sufficient quantity. Mix to form a mass. *Dose :* 2 to 4 grains.

Tonic Pills.—Quinine phosphate, 1 gr.; strychnine phosphate, 1/32 gr.; extract of belladona, $\frac{1}{4}$ gr. Addition of reduced iron 2 gr. will make these Blood Increasing Pills. Advise the use of plenty of milk and ghee.

Harter's Iron Tonic.—Calisya bark, 2 oz.; citrate of iron, 2 oz.; cardamom major seeds, 2 oz.; simple syrup, 2 oz.; alcohol, 2 oz.; water, 8 oz. Stir well. *Dose :* $1\frac{1}{2}$ dr. twice daily after some food.

Anti-Anæmia Tonic.—Iron and ammonium citrate, 120 grains.; glycerine, $\frac{1}{2}$ fl. oz.; pepsin wine, $\frac{1}{2}$ fl. oz.; arsenical solution, 48 mm .; spirit of chloroform, 1 fl. dr.; tincture of nux vomica, 48 mm.; tincture of quinine, 1 fl. oz.; infusion of columba, sufficient quantity to produce, 8 fl. oz. Mix. *Dose :* $\frac{1}{4}$ fl. ounce twice a day half hour after meals.

Nervous Debility.—Syr. brahmi at glycerophos co., 1 dr.; Tr. nux vomic mm. 3; spt. chloroform, 10; mm. aqua, add oz. 1. Twice a day after meals. Brahmi is Indian pennywort.

Neurasthenia.—Moschi, 5 gr.; zinci valerian, 5 gr.; pulv. asafætida, 3 gr.; camphor of monobrom, 2 gr.; Ft. capsule one. *Sig.* To be taken twice daily.

Dr. Robin's Syrup of Glycero-Phosphates.—Calcium glycerophosphate, 3 dr.; sodium glycerophosphate, 6 dr.; potassium glycerophosphate, 1 dr.; magnesium glycerophosphate, 1 dr., iron glycerophosphate, 30 gr. pepsin 90 gr.; diastase, 30 gr.; tincture of ignatia seed, 60 drops; tincture of kola seed, 5 dr.; syrup of cherry to make 15 oz. by weight. *Dose :* $\frac{1}{2}$ oz.

Godfre's Cordial. *Ingredient.* Tincture opium, 6 oz.; molasses, 80 oz.; alcohol or brandy, 8 oz.; water, 120 oz.; carbonate of potash, 4 dr.; oil of sassafras, diluted with alcohol, 1 dr.; Dissolve potash in water, add molasses, make a solution by gentle heat, remove scum and add other constituents.

Tonic Elixir.—Iron and quinine citrate, 3 oz.; tincture of nux vomica, $1\frac{1}{2}$ fl. oz.; dilute phosphoric

acid, 2 fl. oz.; glycerine, 12 fl. oz.; chloroform, 3 fl. drs.; burnt sugar, ½ dr.; water to 100 fl. oz. Digestive and blood increasing. *Dose:* ½ oz. once a day after meals.

Efficient General Tonic.—For patients who are generally "run down" and chronically tired the following prescriptions prove very useful:—

Adrenal substance (Wilson) gr. 6; Ext. Cascara Sagrada, gr. 12. Reduced Iron gr. 24. Sod. Bicarb. q.s. add dr. 2½. M. et. ft. Capsule N , 24.

Sig. One, three times a day, with meals.

Pick-me-up.—Sodium bicarbonate, 20 gr.; spirit of sal volatile, 20 drops; compound tincture of cardamoms, 1 fl. dr.; syrup of oranges, 1 fl. dr.; infusion of gentian, 1 fl. oz.

Rachitis (Rickets.)—Olec Morrhuæ oz. 4; sol. gr. calcii lactophos, oz. 4; tinct. cinnamon, 75; mm.

M. Sig. Two to five teaspoonfuls daily.

Life Drops: *For critical discharges, dysentery and other summer complaints that lower the vitality.*—Opium, 1 oz. gum; kino (substitute purified catechu), 1 dr.; camphor, 40 gr.; fine powder of nutmeg, ½ oz.; Brandy Exshaw No. 1 or any other available, 20 oz. Mix. Let stand from 1 to 10 days according to emergency. *Dose:* 30 to 40 mm. for adults. Children 15 to 20 mm. according to age.

Cod Liver Oil, Delicious Emulsion of.—Yolk of 2 eggs; powdered sugar, 2 chhtks.; essential oil of almonds, 2 drops; distilled water of orange flowers, 1 chhtk. Mix carefully and add an equal bulk of fine Norwegian pure cod liver oil manufactured by Merck or any respectable manufacturer.

Cod Liver Oil, Masking the Taste of.—Take essence of lemon, 4; sulphuric ether, 2; essential oil of caraway, peppermint, cloves, 1 each. Add 12 drops of this solution to every tablespoonful of oil.

Cod Liver Oil with Iodine of Iron.—Very much recommended in anmæia and phthisis. Dissolve 25 parts of iodine in 197 parts of cod liver oil by frequent agitation for a few days. Put this in hermetically sealed tube with 5 parts of iron dust and shake for 4 or 5 hours till a purple violet colour is obtained and no

more free iodine is present. (A drop of iodide of potash and starch will be turned blue by free iodine). Let settle for 24 hours. Bottle in yellow glass phials holding no more than 5 days' doses. Contains 1.23% iodine and 0.27% iron.

Petroleum Emulsion.—Calcium Hypophosphite, 40 grains ; sodium hypophosphite, 60 grains ; gum acacia in powder, 1 ounce ; elixir of glucoside 40 minims ; liquid paraffin, 2 fl. oz. ; essential oil of almonds, ½ minim ; distilled water, sufficient quantity to produce 6 fl. oz. *Dose* : 1 to 4 fluid drachms.

MANUFACTURE OF OVALTINE.

Twenty years back we never heard of Ovaltine in India. Now the advertising campaign of Ovaltine has made it a household word all over Indian cities. Ovaltine is a delicious and energising beverage, much better than tea. That it does contain malt and cocoa there is no doubt about it. Besides these two ingredients, roasted starch acted upon by diastase may be mixed. Try the experiment till you have perfected the article or made some nearest approach to it. Keep your process secret and through your own efforts find out somebody to finance your scheme. You require at least 1,000 air-tight cans, and materials enough to fill them, but above all you require enough money for propaganda work.

SKIN DISEASES.

Sure Corn Cure.—Tincture iodine, ½ oz. ; antimony chloride, ½ oz. Mix well. Pare the corn with a blade or a sharp razor. Apply to the spot with a small pencil brush . Will sell well. Price it at 12 As. a bottle. For additional recipes see chapter XI.

Lotion for Black-heads—Black-heads are the most difficult thing to get rid of once they have firmly made up their mind to stay. However, here is a lotion that very seldom fails : Rectified spirit, 1½ dr.; sulphur, 1 dr. ; glycerine, ½ oz. ; iderflower water, 3 ounces.

Wash and steam the face thoroughly and then sponge the skin with a little of this solution.

Pimple Cure.—Pimple of the nature of ulcers will yield only to medical treatment. For small red pimple,

wash frequently with warm water and with a rough towel rub for a long time. Then apply a lotion made of sulphur water, 2 oz.; acetated liquor ammonia, 1 oz.; solution of potash, 1 oz.; white wine vinegar, 4 oz.; distilled water, 4 oz. Use the lotion twice daily.

Sure Shot Cure for Small Pox.—Small pox is a periodic disease: it has to run its course. As a prophylactic and as a curative agent the following remedy claims never to fail. Cream of tartar, 1 oz. Dissolve in 20 oz. of boiling water. Let cool. Take small doses at intervals.

Pitting, To Remove.—Sweet oil, pomade or ointment, mixed with croton oil sufficient to raise a slight pustule serves as the safest cure. Apply at intervals for a month or so.

Itch Cure.—Zinc carbonate (precipitated), 2 dr.; zinc oxide, 2 dr.; carbolic acid, 30 mm.; lime water (q.v.) to make 8 oz., Wash with a piece of muslin dipped in above lotion.

Itch, Treatment of.—(1) Take a bath in water in which only a small quantity of potassium permangnate has been dissolved. Try this several days on end. Well tried.

(2) Make an ointment with karwa oil of the following: myrtyle leaves, *babchi*, lead nitrate (*gandhak amla sar*), Realgar (*manchhal*), Catechu (*Katha*), Mercury. Pulverize the ingredients to a fine powder along with mercury. Well tested.

Barber's Itch.—Iodol, 2; ichthyol, 3; flowers of sulphur, 6; bismuth formic iodide, 3; Lard, 48. Rub on the affected parts twice or thrice daily.

Household Embrocation.—Liniment of camphor; 1 fl. oz.; liniment of soap, 1 fl. oz.; colza oil, 16 fl. oz.; solution of ammonia, 12 fl. oz.

Sour Lemon Drops.—Have a batch of barley squares made. As soon as the matter is poured on to a stone slab, let ¾ oz. of dry tartaric acid be sprinkled over the matter, and then two tablespoonfuls of essence of lemon. Work the batch like flour dough. Run the dough through a drop machine or roll it on a table with the help of a roller just near a hot stove and cut into

the desired pieces. Cool dough must give good results. Should the table get sticky, sprinkle white flour or fine starch over the spots to act as we call *plethan*.

CAKES

Sponge Cake.—Beat together for 10 to 15 minutes, the yolk of 10 eggs with 1 lb. of white sugar powder to a stiff paste. Add 1 powa of sifted white flower by degrees. Spice with nutmeg or grated rind of lemon. Lose no time in baking.

Sugar Cakes.—*Ingredients*: White flour, $\frac{1}{2}$ seer; 6 chhtks. sugar, 1 powa of butter, yolk of 5 eggs. Mix. Place the dough on tins and sprinkle over with sugar. Put into an oven to bake. Frost if you like.

Cup Cake.—*Ingredients:* Sugar, 3 cups: butter, 1 cup; soda, 2 teaspoonfuls; eggs, 3; flour, 5 cupfuls. Beat together; flavour to taste and bake.

Lemon Cake.—Rub a tea cupful of butter with 3 tea cupfuls of powder of crystal sugar (*boora*) to the consistency of a cream, then stir in well-beaten yolks of 5 eggs. Dissolve a teaspoonful of sodium bicarbonate in a teacupful of milk. Add the milk to the previous lot. Add the juice and grated peel of 1 lemon. Sift in as gently as possible 4 teacupfuls of white flour. Bake as usual. Greatly improved by icing.

Queen Cake.—*Ingredients:* Sifted white flour, 1 seer; sugar, 1 seer; butter, $1\frac{1}{2}$ seers. Make a cream of butter and sugar by rubbing them well. Add yolk of 5 eggs, 1 powa of brandy, and a powa of cream with a portion of the flour and 1 seer of stoned raisins or currants, spice to taste. Add the whites of 5 more eggs beaten to a stiff froth with the remainder of the flour. Cut up to the required size in moulds and bake.

More Pharmaceutical Preparations given in Chapter XXVII, Specially on p. 379 et. seq.

CHAPTER XXII.

IMITATION ARTICLES.

Recipes of Imitation Gold, Grape and Sandalwood Jams, Ghee Substitutes and Imitation Phenyle have already been given. See Index

Amber, Imitation.—Shellac is dissolved in an

alkaline lye, through which is passed chlorine until all the shellac is precipitated. Drain off the water, wash precipitate, melt it and keep over the fire till it runs clear, taking care that it does not burn. Pour into desired moulds.

Artificial Building Stone.—Form the paste with water of 10 parts of hydraulic lime, fallen to powder; add 25 parts of gravel, and 5 of coal ashes or lixiviated wood ashes. Mix well; add sufficient water to make the mass 50; pour into moulds of pine boards; allow to set.

Camphor Fictitious.—Dry the hydrochloric acid by allowing it to pass through sulphuric acid contained in a wash bottle. Let the gas then pass through oil of turpentine cooled by freezing mixture (See Index). This produces a white crystalline mass which should be dried between blotter and purified by solution in alcohol.

Caoutchouc or Rubber Artificial.—Obtain skin or waste thereof of small animals *e.g.*, hares, rabbits etc., cleanse in water; remove hair* by soaking in lime water; and boil with 5 per cent. of crude glycerine and as little water as possible, until completely dissolved. Dry the thick fluid so obtained on nets in an airy but dust free room or work the mass for the desired purpose at once. Melt over a water bath 3 parts by weight of the mass with as much crude glycerine, then add $\frac{1}{4}$ part by weight of a saturated solution of potassium bichromate. Pour into moulds and solidify under pressure in a dark room. It can stand greater heat than genuine caoutchouc. Waste scraps of vulcanized India rubber are pulverized and mixed with a solution of calcium sulphide and tar (coal tar). The mixture is heated from 24 to 63 hours in a closed digester to dissolve out the sulphur added in vulcanizing, and the tar is distilled off at reduced pressure. The mass is then stirred and washed with hot water. (c) The following may also be tried; Linseed oil, 2 lb.; cotton seed oil, 1 lb.; petroleum oil, 2 lb.; raw turpentine, 2 lb.; sulphur, 2 lb; boil for two hours.

Celluloid, Imitation.—Gelatine is a fairly good substitute. It can be turned into thin films which are

* The hair can be removed by applying the milk of *ak* plant to the skin.

quite transparent and almost colourless, the only drawback being that it is a little brittle and is not waterproof. Viscose, a patented cellulose, can be had in beautiful transparent films. It does not catch fire so easily as is the case with celluloid. To obviate the defect of brittleness, addition of $\frac{1}{2}$ to 1% of glycerine will make it flexible, and to make it waterproof and insoluble it should be dipped in formaldehyde.

Cocoanut Butter.—Cocoanut oil has a decided odour which is due to an acid. This acid is removed by treating the oil in a tank with powdered chalk. The chalk combines with the acid and settles to the bottom. The clear oil is filtered four or five times and removed to another tank through which run coils of pipes by means of which it is heated by steam to about 270°. This process is allowed to go on till the oil begins to bubble and is quite clear. The steam evaporates the remaining odour. Heating with open fire will spoil the oil. The oil is then pumped into an automatic weighing apparatus and measured quantities run into moulds and allowed to cool.

The oil so purified will save the soap manufacturers from a lot of perfume for masking the odour of the oil. This oil is equally useful for manufacturing hair oils.

Coffee Substitute.—Mix 4 parts of ground malt, 2 of ground coffee, and 2 of chicory. When prepared, the mixture affords a nourishing, agreeable and good flavoured beverage. See also Index.

Emerald, Artificial.—Substitute for cobalt carbonate red ferric oxide, 1.21, green copper carbonate, 0.60.

Flowers, Artificial, Mass for.—Let bread crumbs, magnesia, and fine powder or starch, ferment, when they can be moulded and coloured as desired. Use indigo carmine, saffron or various lake colours, and for varnish a solution of gamboge in alcohol.

Fuels, Artificial.—These fuels are very economical: (1) Knead 2 parts of soft moist clay without any stones, with 1 part of coal dust and make small balls. Let dry. (2) Treat equal parts of powdered coal or charcoal, and coke, and moist clay similarly. Make balls of the size of hen's eggs, sawdust and finely cut straw may

also be mixed. (3) Cow or horse dung, sawdust, peat or straw may be intimately mixed with dry grass, pitch, tar, oil cake, etc. The larger the stove, the greater should be the proportion of coal.

Gold, Oroide.—Take purest copper, 8; purest zinc, 3½; magnesia, ½; sal volatile, 1-5; quick lime, 1-6; cream of tartar, 2. First of all melt copper and then at once add other ingredients in like order given above.

Gold, Manheim.—For Flash Jewelry.—Copper, 3; zinc, 1; block tin, 1. Take all the ingredients in the purest form. Melt in a covered crucible containing soft charcoal. Fuse by placing the crucible in a reverberating furnace. This gold has been used for cases of watches with marvellous deception for hundreds of years. Even the best judges on mere looking at it have not been able to tell it from pure gold. Of course aqua regia exposes all admixtures. *See also next Chapter.*

Gold, Pinchbeck for Watches and Jewelry.—Extra pure copper, 5; zinc, 1.

Honey, Artificial.—(1) Boil 5 seers of white sugar with 2 seers of water. Skim well. When cool, mix 1 seer of bees' honey and 4 drops of oil of peppermint. (2) Heat slowly to boiling point, sugar 10 parts, and rain water, 3 parts. Let boil on slow fire for 10 minutes. Skim well all the while. When cool, add 3 parts of purified genuine honey and 5 drops of oil of peppermint. Add a boiled solution of 20 grains of cream of tartar. Loaf sugar is better than common brown sugar.

Honey, Artificial, from Invert Sugar.—Study the composition of natural honey (*vide* Directory). Invert sugar is made from surcose by heating in solution with small quantities of mineral acids; 75.80% surcose; 02.00 per cent of hydrochloric acid or 0.2% of tartaric acid from 90° to 100° C., later on neutralising with soda. The resulting syrup must not be concentrated, otherwise it will get brown. The inverted sugar so made is as good as honey, only it is deficient in flavouring substance. By mixing it with 25% of natural honey, the product becomes in all essential properties as good as real honey, and therefore by no known methods can be detected from the natural product.

Horn Substitute.—This can also be used as hard rubber and ivory substitute in the manufacure of combs, buttons, etc. Make by stirring a thick paste of starch in water. On heating this from 212° to 265° F., it is changed into a transparent elastic mass, when it should be dried and worked. If desired, pigments, glue, sugar, wool, silk, fish scales, etc., may be mixed, with the starch paste.

Iodoform Substitute.—Salol, 8 oz.; zinc sulphate, 12 oz.; benzoin, 2 oz.; talcum, 18 oz.; oil of winter-green, 80 drops.

Ivory, Imitation.—(*a*) Prepare a solution of 20 parts of casein (dehydrated cheese), in 5 of ammonia and 40 of water or in 15 of albumen (white of egg) and in 40 of water; to which add quicklime, 24; acetate of alumina, 15; alum, 5; sulphate of lime (gypsum), 120; and last of all, oil, 10. Replace acetate of alumina by 7.5 to 10 parts of tannin, if dark objects desired. Knead the mixture well, and pass the paste through rollers to form plates. Dry and press into moulds previously heated. Take out and dip in the following bath: Water, 10; white glue, .1; phosphoric acid, 1. Again dry; polish and varnish with shellac.

(*b*) Mix 10 parts of white shellac; 8 of ivory dust; 4½ of acetate of lead, and 5 of camphor. Heat; dry; powder and press it.

(c) Dissolve 1 seer of Indiarubber in 15 of chloroform, and saturate the mixture with purified ammonia gas. Recover chloroform by distillation. Mix the residue with powdered bone ash* or zinc carbonate, press into moulds and cool. That marked with * imitates more of genuine ivory. For one great use of imitation ivory, see *Industrial and Other Openings for Youngmen.*

Indigo, Artificial.—Indigo is synthetically made by an elaborate process. A solution of a-isatine-anilide is reduced with ammonium sulphide. In the proces 40 kg. of a freshly prepared ammonium sulphide solution, containing 10% of hydrogen sulphide, is made to flow quickly, and with constant stirring, into a heated solution of 20 kg. of a-isatine-anilide in 60 kg. of alcohol. The heat is generated by chemical combination. Tem-

porary green and blue coloration, and an immediate separation of indigo in the form of small crystalline needles of a faint copper-like lustre are produced. The heating is continued, presumably by external means, to boiling point, when the indigo is obtained by filtration, rewashed with alcohol, and dried.

Leather, Artificial, for Lithographers.—Melt on a water bath: syrup, 20; glue, 20; saltpetre, 3; water, 5; oil of almonds, 1; chrome yellow, 1. Pour round a core about half an inch less in diameter than the mould. Let cool. Take out and place in a solution of alum, 1; potash, 1; water 10, for 10 hours. Then dry in the air for 4 to 6 days.

Leather Substitute.—Used for shields and caps; Mix in a proper vessel wax, 4; caoutchouc, 2; resin, 1; bone black, 2; lamp-black, 1. Apply the mixture even when warm to cloth, etc., with a brush. On completely drying, repeat coating several times. Last of all, lacquer as desired.

Marble, Imitation.—Take alum, 100; heavy spar being taken according to the degree of translucence desired. Dissolve alum in water by heat, and as soon as the mixture begins to boil, add heavy spar stirred with water and then any colour. Boil until 3% has evaporated when the mixture has a density of 34 Be. at 100° C. Allow to cool with constant stirring until a semi-liquid is obtained. Pour into moulds smeared on the inside with several layers of collodion. Let cool and set. Then take out and let dry in an airy room.

Musk, Artificial.—Musk used for scenting the clothes and in making perfumery. Place 1 part of oil of amber in a wide mouthed bottle and add four of nitrous acid by degrees, stirring all the while with a glass rod, till the whole is changed into a yellow rosin. Keep in well corked bottles. (*N.B.*—Nitrous and not nitric acid.)

Solid artificial musk is now imported from Germany in large quantities.

Olive Oil, Factitious.—Use refined Cotton Seed oil. See Index.

Pharaoh's Serpents, Safe Substitute for.—Take 2 parts of potassium bichromate; 1 of saltpetre;

3 of white sugar. Powder each separately; mix well. Press the mixture in small paper cones. Keep perfectly dry.

Rubber-soled Shoes, Imitation.—Get old tyres of motor-cars and motor-lorries. The soles can be made of these tyres with parts of canvas or leather. *To cement leather with rubber* the following solution should be used :—

Carbon bisulphide, 19 parts; oil of turpentine, 1 pt.; gutta percha cut in small pieces as much as can easily dissolve. Mix the turpentine and carbon bisulphide and add sufficient gutta-percha, under frequent agitation, or rubbing up, until a thick paste is obtained. To make a good joint all fatty or greasy matter must be got rid of by washing with soda solution. *To soften and make elastic again*, put the cut out pieces of tyre in a strong solution of alum in water for a day or two.

Rubies, Imitation.—Use the following mixture in form of powder : I. Rock crystal, 29.23; dry sodium carbonate, 14.61; calcined borax, 10.96; saltpetre 5.47; purple of cassius, 9.65; antimony trisulphide, 0.48; manganese peroxide, 0.48; minium, 10.96. Or II. Rock crystal, 29.23; dry sodium carbonate, 14.61; calcined borax, 4.84; saltpetre, 2.43; purple of cassius 0.91; sal ammoniac, 3.65. Mix the pure white sand or rock crystal with a solution of a ducat (about 2 gold value) and then add the other constituents. Expose the mixture to a white heat in a plate glass furnace. It puts on a ruby colour after heating to a moderate red heat, 232° F.; a liver colour, if exposed to very strong heat. *See also next Chapter.*

Saffron, Artificial.—According to new edition of *Encyclopædia Britannica* (Vol. XXI page 146) artificial saffron is made from grease and butter into which fine shreds of beef are mixed after dipping into a solution of real saffron. Real saffron is now a rare commodity. Artificial saffron is sold on a large scale and is used without any scruple even by Pandits. The grease employed is largely obtained from pigs. Religion is no consideration in British trade. In course of time India may follow suit.

Salajit (Storax), Artificial—Artificial Salajit is nothing but caramel. The method of preparing the caramel is given in the chapter on Household Requisites. As a tonic it is worse than useless. The imitation article is much lighter than the genuine product. Both, however, give yellow tinge to water. (See Index).

Sandstone, Artificial, for Filtering.—Knead the following mixture with water, shape into the desired form, and burn strongly in an oven or kiln.

	I	II	III
Clay	10	10	15
Chalk	1	1	1
Glass sand, coarse ..	55	..	..
,, fine ..	..	25	65
Flint	..	30	5

Great demand can be created for properly made filters where canal or ordinary surface water is used for domestic purposes. Ready made filters should be sold. Very good as a side line for pottery works.

Sapphire, Artificial.—Treat as *Imitation Rubies* (supra); Rock crystal 43.41; sodium carbonate, 21.92 calcined borax, 7.20; minium, 7.20; saltpetre, 3.66, cobalt carbonate, 0.06.

Silk, Artificial.—A factory is reported to have been established in Japan to produce five tons of celluloid and half a ton of artificial silk daily. Celluloid is made by treating nitro-cellulose with camphor. The best artificial silk is that produced by the Chardonnet process, which likewise makes use of nitro-cellulose as a raw material, and it is asserted that Japan, although a large silk-producing country, has hitherto imported a considerable quantity of the artificial silk, which is used in Kioto for making tapestries, screens, and embroideries. It will thus be possible for the new company to employ its raw material either for the preparation of celluloid or for artificial silk in accordance with the state of the market.—*Industry*.

Silver, Factitous.—(1) Refined nickel, 11; metallic bismuth, 2. Melt thrice, and pour into ley. During third melting, add 2 parts of pure silver. (2) Nickel, 40; block tin, 30.

Silver, Imitation.—Melt 65 parts of iron with 4 of tungstic acid, and granulate. Melt also 23 of nickel, 5 of aluminium, and 5 of copper. To avoid oxidation, place a piece of sodium in the crucible. Melt together the granulated metals. This alloy is unattacked by sulphuretted hydrogen, and so is superior to pure silver for making utensils. *See also next Chapter*

Wool Artificial.—Hemp, flax or jute is boiled with caustic lye, at 350° F. for half an hour, washed, and repeatedly boiled in another boiler containing 2 oz. of ammonia, sulphate of copper and 2 lbs. of soda to every 100 lbs. of material, is thereafter washed, dried, and mixed with wool.

CHAPTER XXIII

IMITATION JEWELRY.

Imitation Ornaments.—By the word imitation is here implied factitious gold or silver with which these ornaments are made.

There never was so great a demand for artificial jewelry as it is now in India when her hoards in gold have been depleted.

There is indeed a great demand for these ornaments in rural areas and also among the lower classes. The well-to-do classes are very much enamoured of gold and have an insatiable lust for hoarding up their riches in the form of gold jewelry. They can also be persuaded to use imitation ornaments for their children for fear of their being robbed when all alone.

Thus it is that *tilis* (nose-studs) of artificial gold made in Madras are now fast pushing out the *tilis* of Amritsar.

Ornaments that can command a large sale in one part of India may not appeal to another part and as such particular conditions must be studied. What is most wanted is stylish and fashionable ornaments.

There are three things in the manufacture of ornaments : *Model.* These ornaments may be in the first instance made of silver by some silversmith or better still if you yourself could borrow moulds for a

few days. These moulds should be concave and divided into two detachable halves and in the hollows left the melted alloys should be run. Then there is the composition for moulds.

Composition for moulds.—Plaster of Paris, mixed with equal parts of powdered pumice-stone, makes a fine mould for casting fusible metals. The same mixture is useful for articles to be soldered, or brazed casts of Plaster of Paris may be made to imitate fine bronzes by giving them two or three coats of shellac varnish, and when dry applying a coat of mastic varnish and dusting on the bronze powder when the mastic varnish becomes sticky.

IMITATION GOLD.

Since times immemorial human skill has been busy in the search after some method by which baser metals could be turned into the precious ones, and although Science has for a long time discredited the transmutation of metals, the discovery of radium from the uranium compounds has again revived the lost hopes.

Pure gold is not affected by anyone of the acids. A mixture of nitric and hydrochloric acids, however, has the property of dissolving gold. (*See Aqua Regia.*) Gold is nineteen times as heavy as water. These are the two distinctive properties of gold.

How to make Gold.—A new formula has been discovered for making synthetic gold by chemical means.

One simply brings to a temperature of 1100 degrees with a blast furnace a mixture of 6 grammes of pure silver, two grammes of yellow silver, two grammes of antimony, one gramme of orpiment and one gramme of tin. During the process additions of silver and antimony are injected into the mixture which is afterwards treated by washings with distilled water and ammonia. The liquid is then filtered and gold is found as a deposit.

The inventor of the formula, M. Jollivet Dasielot, a French chemist, is convinced of the commercial value of his process.

Nuremberg Gold.—Used for making cheap gold vessels. Colour unaffected by air and resembles gold perfectly well. Articles manufactured from this alloy need no gilding. Broken vessels also show the gold

colour. Take 90 parts of copper, 2·5 parts of gold, and 7·5 parts of aluminium. Broken vessels may be used. To fuse all these together a blast furnace will be required.

As regards Nuremberg Gold, even the Swedish business houses were cheated to the tune of £18,000 by an alloy of gold by Soviet Russia in 1920.

For Dutch Leaf Gold.—Copper, 11 parts; zinc, 2 parts. Leaves not exceeding 1-52900 inch in thickness may be beaten out. Melt metals in graphite crucibles and keep them fluid for some time. Cast into ingots about 2 feet long and 3-4 inch in diameter. Roll cold as thick as this paper. Hammer into ribbons about 4 inches wide. Cut the thin strips into pieces. Hammer again until torn at the edges. Cut into square leaves and place between parchment leaves and beat with a hammer till each piece is enlarged to 6 inches square. Cut each leaf into four equal squares and beat like gold leaves. For all ornamental purposes, these leaves are now extensively employed.

Imitation Gold.—Copper, 16; platinum, 7; zinc, 1. Fuse together. Just like 16 carat gold. But owing to now prohibitive price of platinum, the formula is of little commercial value.

Nine-carat Imitation Gold.—Silver, 2.48; platinum, 32·02; copper, 65.5; not affected by strong boiling nitric acid.

Cheap Jewelry Gold.—I. Copper, 88·8; zinc 11·2. II. Copper, 5 lb.; zinc, 1 lb. Can be rolled into thin plates. Does not readily mix with oxygen.

Mock Gold.—Platina, 2 ; silver 1 ; copper, 3. Mix a little powdered charcoal when melting.

Commercial Possibilities of Imitation Gold.—The various kinds of imitation gold manufactured as above can be used for making village jewelry, imitation gold vessels, and gold nibs for the fountain pens. Watch making is an industry unknown to our country, but should efforts be made to establish this business in the comparatively dry hill stations, *e.g.*, Mount Abu, Jummu and Kashmir hills and the Suleman range on Quetta side, a great field for the consumption of imitation gold could be thrown open for the young aspirants.

The manufacture of gold nibs and of waches are two great industries, fraught with immense commercial potentialities, requiring little raw material but much human skill and labour, especially the latter. If some of the deluded millionaires instead of sending their sons or wards for barristership to England should have sent them to Switzerland for learning the art of watch manufacture, India should have been all the better and richer for it while the parents or guardians themselves should have piled up vast amount of riches.

Composition for Gold Ornaments.—Use Nuremberg gold. See above.

Ring Gold.—Coin gold, 4.96 parts; Silver, 12.3 parts; refined copper, 23.6 parts.

Imitation Gold.—The following recipes for metals resembling gold are said to produce a metal which will so nearly approximate the genuine as almost to defy detection without a resort to thorough tests: Fuse together with saltpetre, sal ammoniac and powdered charcoal: 4 parts platinum, $2\frac{1}{2}$ parts pure copper; 1 part pure zinc; 2 parts block tin; and $1\frac{1}{2}$ parts pure lead. Another good recipe calls for 2 parts platinum, 2 parts silver; and 3 parts copper.

Jewelry Gold.—Copper, 70 parts; manganese, 30 parts; zinc, 20 to 35 parts. *Or* if not needed to be subjected to high temperature: copper, 49 parts; manganese, 21 parts; iron, 5 to 10 parts; zinc, 5 to 10 parts. The solder used for it contains copper, 7 parts; manganese, 3 parts; silver, 1 to 2 parts.

Gold, Factitious.—(*4-carat gold.*) Copper, 9 parts; gold, 2 parts; silver, 1 part.

Mock Gold.—Copper, 16 parts; platinum, 7 parts; zinc, 1 part. *See also previous Chapter*

SILVER SUBSTITUTES.

Aluminium Silver.—The following alloy takes a high silver polish, and exhibits a beautiful silver colour Copper, 70 parts; nickel, 23 parts; aluminium, 7 parts.

Silver Substitute.—Copper, 57%; nickel, 20%; zinc, 20%; aluminium, 3%. The liquid metal, completely fills the mould, giving sharp, clean castings, true to pattern; its cost is not greater than brass; its colour

is silver-white, and its hardness makes it susceptible of a high polish.

Note. Before putting these ornaments on the market, they should be silver-plated, *i.e.*, electro-plated. See Index.

Imitation Silver Ornaments, Composition for.—(Argent-Ruolz), The articles which are manufactured by the Paris firm of Ruolz, under the name of Ruolz silver, or Argent-Francais, resemble pure silver perfectly in appearance, but differ from the latter in greater hardness and a much lower price according to the quality of the object. Various alloys are employed in the factories of Ruolz silver. We give below the composition of some of the alloys as produced in the French factories :

	I	II	III
Silver	30	49	20
Copper ..	37—42	30—40	45—55
Nickel	25—30	20—30	25—35

See also previous Chapter.

ARTIFICIAL PRECIOUS STONES

Diamonds, Artificial.—Very beautiful diamonds are produced by passing a powerful electric current through a liquid sulphate of black carbon. Another method for converting the common mineral corundum which is only worth about two francs per carat, into rubies and sapphires of a market value equal to thirty francs per carat has also been found out by a French savant. Yellow corundum when exposed to the action of radium turns into a fine clear ruby, while red varieties become amethyst; the violet sapphire and the blue topaz.—*Industry.*

Imitation Rubies.—Ruby is made artificially by melting pure alumina and colouring it with oxide of chromium by the heat of electric or the oxyhydrogen blow pipe. The sapphire could not be produced by an analogous method. After some attempts M. Paris, of Pasteur Institute, has now succeeded in obtaining the sapphire in the laboratory of that establishment. His method consists in introducing foreign elements into

the combination. Alumina and oxide of cobalt are theoretically all that is necessary to form the sapphire. The latter serves to produce the yellow colour, and is in a small proportion to the whole amount. The experimenter had the idea of adding 2 per cent of lime and magnesia, and the whole mixture was melted at the usual high temperature. The effect of this combination is surprising. Before this the melted alumina crystallised upon cooling and determinated the colouring matter, but in the present case this crystallization does not take place. The mass becomes coloured and remains permanently in this state. At the time of the highest heat the lime and magnesia are driven off and the alumina coloured by the oxide of cobalt remains. This substance is therefore the artificial sapphire and it is chemically identical with the stone found in nature.—*Ibid. See also previous Chapter.*

CHAPTER XXIV.

OIL REFINING.

Acidity of Lubricating Oil, To test the.—Dissolve about a tola of sodium carbonate in an equal quantity of water. Place this solution along with some of the oil to be tested in a flask. Agitate briskly. Let stand. If much precipitate form, the oil is no good as a lubricant.

Cocoanut Oil, White Odourless, for Perfumery.—Rub up the cocoanut oil to incorporate with warm water, placed in a bag and pressed through it. Bring the fluid so obtained to boiling point. The separated oil should be clarified with sugar and alum in much the same way as syrup is clarified.

Cotton seed Oil.—The extraction of this oil is very paying. The refined oil being edible and only next to ghee can be much popularised. The oil cake forms one of the best food for cattle and ewes. Pregnant cows should not, however, be fed on this cake as they have a tendency to miscarriage. The ewes on the other hand if fed on this bear twins and also yield more of oil fat which by the use of naphtha in its preparation can be employed as the best tanning oil. The dung of cows fed on this cake is very valuable as a

fertiliser. 15 seers of seeds can yield not less than 3 seers of oil. *Refining of cotton-seed oil:* Treat 100 gallons of the crude oil with 6 gallons of soda lye of 25° or 20° Be. in a tank and heat for an hour or so to about 200 to 240° F. with constant stirring. Let settle when the clear oil is separated from the brown soap stock. The latter should be placed in bags which will ooze out more of oil. The refined oil has much the same lubricating, pharmaceutical and edible values as olive oil. It keeps limpid upto 30° F., quite fluid upto 20° F. and hardens only at 8° to 10° F. Being a fixed oil, it is not explosive. It is a better lubricator and burns longer than lard.

Fatty Oils, To Purify.—Get a tub with a faucet. Place in it a solution of 2 lb. pemanganate in 6½ gallons water. Add 18 gallons of oil and agitate well. Let settle for 2 days. Add a solution of 11 lb. of hydrochloric acid in 4 gallons of warm water. Agitate thoroughly. Let stand for several days when the oil should be syphoned off and washed with hot water to remove acid.

Kerosene Oil, To Make Odourless.—Shake 200 gr. of chlorinated lime with 95 quarts of kerosene oil. Add a little hydrochloric acid. Pour off the liquid into another vessel containing small pieces of caustic lime. Agitate to remove all traces of chlorine. Let stand and decant.

Lanolin, Extraction of.—This product is obtained from sheep wool. Many medicines mixed with lanolin are said to be absorbed by the skin more quickly than when prepared with other fats. Prof. Liebreich obtains the suds from the woollen factories, subjects them to the action of centrifugal machines, separates the dirt from the oily suds, which are then decomposed by an acid, the acid combining with the saponifying alkali producing wool fat which is well washed with clean water to obtain pure lanolin. When lanolin is required only for external medicaments, it may be more quickly obtained by treating the wool with petroleum. Benzine can be distilled off, leaving behind the wool-fat which should be mixed with sufficient water to get lanolin.

Linseed Oil, Quick Drying.—Warm the oil in an iron boiler. Pour in melted lead in a thin stream by degrees. Let stand for several days in a warm place when on a precipitate being given off, the clear oil separates. *Especially suited for lacquers and varnishes.*

Lubricating Oils, To Purify.—Select a tub to hold about 70 seers, with one tap at the bottom, and another about 4″ higher up. Place in this 7 seers of boiling water, 1/64 as much sodium carbonate, and about $1\frac{1}{2}$ chhtk. of bleaching powder and 3 chhtks, of common salt. Agitate thoroughly; put in 45 seers of oil to be purified and stir briskly for 5 to 10 mts. Let stand for a week in a warm place when the clear oil should be drained through the upper tap.

Mineral Oils, To Purify.—To remove the unwholesome odour, prepare a saturated solution of pot. hyposulphite and caustic soda in alcohol. Pour the mixture with constant stirring into the oil, 5% to 9% of solution is sufficient. Let stand when the oil should be drawn off into another mixing vessel and again compounded with lye.

Oils and Fats, To Bleach.—(1) Expose to sunlight in white bottles. The oil is soon decolourised but becomes rancid in taste. (2) Agitate with 2% solution of pot. permanganate. Not fit for food. (3) Agitate with gum water to form an emulsion, to which add coarsely crushed wood charcoal. Warm the mass slowly below 212° F. (100° C). Let cool, then dissolve the oil with ether or petroleum spirit, the latter being recovered for re-employment by means of distillation.

Oils, To Purify.—Heat them with 2 % to 3% of sodium di-sulphide from 77° to 95° F. Stir on till all the sulphurous acid has been evaporated.

Paraffine, etc., Bleaching of (for the Manufacture of Candles).—Filter the crude paraffine and boil it for 2 hours with 5% as much of sodium sulphide in sufficient water. Let cool when the supernatant paraffine should be taken off, washed, pressed, and dissolved in 20% amyl alcohol, from which it is separated as a paste. Let settle, filter through charcoal and solidify by great pressure.

For *bleaching of wax, and for deodorising fat for perfumed soap*, see Index.

Petroleum, Refining of.—(*a*) Put 1 seer of petroleum oil in a big bottle together with 2 to 3 chhtks. of fuming sulphuric acid. Insert a glass stopper. Let stand. Shake several times daily for about a week. Syphon off the supernatant oil, taking care not to breathe the poisonous fumes. Shake several times with water, each time taking fresh water. Let stand. Syphon off into third flask containing 1½ chhtk. of caustic lime in small pieces. The clear as water oil can then be decanted and used for swelling and dissolving caoutchouc pieces. (*b*) Agitate petroleum, 400, with zinc chloride, 100. Pour the mixture into a flask containing small pieces of caustic lime. Mix thoroughly. Let stand for 12 hours. Decant and filter through animal charcoal. (See Index.) A further treatment with litharge solution will remove all traces of sulphur or copper oxide.

Petroleum, To deodorize.—(1) Mix 3 oz. of bleaching powder with 1 gallon of the oil ; add sufficient of muriatic acid till no more chlorine gas is given off. Mix thoroughly. Pour in 3 oz. of slaked lime in solution. Let stand for a few days. Agitate briskly again. Let the lime precipitate when syphon off the petroleum. (2) Mix 1% of amyl acetate. (3) Agitate 1 part of zinc chloride with 40 parts of petroleum ; pour over caustic lime in a big vessel. Stir briskly. Let stand. Decant the oil.

Poppyseed Oil, Impure, To Purify.—Mix 2 parts of cow milk with 5 of oil. Boil for 15 mts. Remove from fire and when even warm, filter. In a few days it will be quite clear.

Turpentine Oil, Factitious or Imitation Rectified benzine *for varnish making where cutting is required :* Mix 1 to 2 oz. of acetic acid with 2 oz. of fresh dry bleaching powder. Agitate briskly and pour into a whole barrel of petroleum. Shake well by rolling. Let stand without the cover of the cask for a full day. Draw off the clear oil and mix with it 4 oz. of fusel oil. Shake well. Let settle and decant.

For purification of Linseed oil, etc., see Chapter II.

CHAPTER XXV.

MATCHES AND EXPLOSIVES.

India imported no less than 11 crores of rupees worth matches every year, although she possessed ample supply of wood, cheap labour, cheap timber, water transport, cheap fuel and above all requires no seasoning of wood. The only drawbacks are that the wood required in the manufacture of matches is scattered over the hillsides from where it is difficult to transport it; that the chemicals are somewhat expensive—this fact does not count for much on account of the increased import duty on matches; and that the climate in some parts of India is very dry. Although there are about 7 or 8 factories still working, there is room enough for a hundred more. A writer in the *Industry* points out that the southern range of the Chanda forest in the C. P. affords the best site for the manufacture of matches as it is on the plains and not on the hills, and as the Godaveri runs right across the forest the transport difficulties can be much overcome. He points out Rajamundry as the best site for the establishment of match factories, the second best site being Chanda in C. P. In Sweden, poplar wood* is used in the manufacture of matches; the unknotted cedars and bamboos can also be employed.

Small factories away from forest areas can be started by making arrangements for a regular supply of splints which are kiln-dried and coated with melted paraffine. The tips are dipped in a bath of melted paraffine and benzine, taken out and again dried when they are dipped in inflammable mass of a consistency that allows only small drops to stick to the tips. The following compositions are employed :

	Parts.			
	I	II	III	IV
Pot. chlorate ..	2000	2000	2000	4000
Lead dioxide ..	1150	2150	..	..
Red lead	2500	2500	2000	4000
Antimony trisulphide	1250	1205	1300	3000
Pot. chromate ..	1318	..	750	1500
Gum-arabic ..	670	670	670	670
Paraffine	250	250	..	.

* It ought to be upto the Forest Department to grow this wood in India, too.

In I and II. the paraffine is rubbed up with antimony and mixed with the compound. The *Striking surface* is prepared by compounding amorphous (red) phosphorus, 9; powdered iron pyrites, 7; glass, 3; glue or gum, 1; water q.s.

Match Composition, Recipes for.—One of the handicaps the Indian match manufacturers have to labour under is the paucity of damp-proof compositions for match heads and sides. This drawback is sought to be removed by the Government of Bengal in the Department of Industries in their Bulletin No. 23 entitled Chemical Composition for Matches.

The following three compositions have been found to give very good matches.

I. Glue, 300 parts; gum senegal 90 parts; gum tragacanth, 12 parts; potassium chlorate, 1,704 parts; barium bichromate, 66 parts; sulphur, 108 parts; ferric oxide, 225 parts; manganese dioxide, 45 parts; glass powder, 441 parts; rhodamine, 6 parts.

II. Glue, 192 parts; gum senegal, 62 parts; gum tragacanth, 10 parts; sulphur, 20 parts; ferric oxide, 20 parts; manganese dioxide, 50 parts; potassium bichromate, 50 parts; zinc oxide, 120 parts; glass powder, 330 parts; rhodamine, 6 parts; potassium chlorate, 140 parts.

III. Glue, 96 parts; gum senegal, 36 parts; gum tragacanth, 10 parts; ferric oxide, 10 parts; manganese dioxide, 13 parts; potassium bichromate, 25 parts; zinc oxide, 60 parts; glass powder, 180 parts; rhodamine, 3 parts; potassium chlorate, 570 parts.

The following composition has been found to give good side painting :—

Gum senegal, 136 parts; gum tragacanth, 7 parts; dextrine, 24 parts; glue, 19 parts; antimony sulphide black, 320 parts; chalk, 52 parts; glass powder, 40 parts; amorphous phosphorus, 400 parts.

Matches without Sulphur.—Do not absorb moisture and will burn by friction on any surface. Dip the tips in any melted fat and on being dried coat with the following inflammable compound :—Phosphorus, 7½; gum-arabic, 7; lead nitrate, 49; powdered glass, 5; water, 10.

Inflammable Compound for Tips.—Mix phosphorus, 1; chalk, 6; anhydrous gypsum, 2·8; glass powder, 6; gum or glue, 6; some colouring matter. Matches with this compound ignite on rough surface with a little report and do not absorb moisture.

Matches without Phosporus.—No risk in the manufacture. Pot. chlorate, 53·8; gum-arabic, 10; gum tragacanth, 3; pyrolusite, 6; iron oxide, 6; glass powder, 12; potassium bichromate, 5; sulphur, 3; chalk, 12; water, q.s. *For striking surface*: antimony trisulphide, 5; red phosphorus, 3; pyrolusite, 14; glue, 4.

Anti-phosporus Matches.—The compound for the friction surface consists of red lead, sand, red phosphorus, rubbed up with a solution of gum-arabic and applied with a brush. Or take red phosphorus, 10; manganese dioxide or antimony trisulphide, 8; glue 3 to 6; water, q.s. Dip the tips in melted sulphur, paraffine or wax and then into a compound of pot. chlorate, 6; antimony trisulphide, 2 to 3; glue, 1; water, q.s.

Chlorate Matches.—Reduce 30 parts of pot. chlorate to a fine powder in a marble mortar; place on a stone table; add flowers of sulphur, 10; powdered white sugar, 8; gum-arabic powder, 5; red lead, enough to colour. Mix in only a little water to form a paste. Dip the tips in this compound and carefully dry in a warm place.

Strike-anywhere Matches.—The composition for the tips of "*Strike anywhere Matches*" consists of red phosphorus with other ingredients as follows:—(1) Phosphorus, 1 part; chlorate of potash, 8 parts; glue, 4 parts; whiting, 2 parts; powdered glass, 8 parts; water, 22 parts. (2) Phosphorus, 2 parts; chlorate of potash, 5 parts; glue, 3 parts; red lead, 1½ parts; water, 12 parts.*

Safety Matches.—Dip the splints in a paste composed of chlorate of potash, 6 parts; sulphide of antimony, 2 to 3 parts; glue, weighed dry, 1 part. The

* Of late, the excise duty on matches has dealt an unbearable and crushing blow to Match Industry in India. It is being keenly felt on account of the fall in average income. The confusion has since been worse confounded by the war situation having quadrupled the sale prices.

paste for the rubbing surface is amorphous phosphorus, 10 parts ; oxide of manganese or sulphide of antimony, 8 parts ; glue, weighed dry, 3 to 6 parts ; the constituents must be mixed well. Chlorate of potash in the dry state must not be mixed at all with the other ingredients, otherwise an explosion may occur. It should be mixed first with glue dissolved in warm water. The paste for the rubbing surface may be spread with a brush or spatula on the sides of the box.—*Beasley.*

N. B.—Red or amorphous phosphorus burns with friction and is non-poisonous : yellow phosphorous is poisonous and burns at ordinary temperature. Be careful not to breathe the phosphorus fumes. Yellow phosphorus should be kept and cut only under water. Red phosphorus should be gently scraped. Pot. bichromate and antimony or its compounds when mixed together, are very dangerous as they catch fire by a shock or friction.

EXPLOSIVE MIXTURES.

The following combinations under certain conditions may explode violently and so care should be exercised when they are combined.*

Chlorates :— *With phenol or carbolic acid ; gallic, oxalic, salicylic or tannic acids ; creosote ; glycerine ; hypophosphites ; iodine ; shellac ; catechu ; lycopodium ; sugar ; sulphur ; the sulphides of antimony.*

Iodine :— *With strong ammonia, oil of turpentine.*

Potassium Bichromate or Chromic Acid :— *With glycerine.*

Picric Acid and the Picrates :—*Do not triturate. Do not heat.*

See also Rockets, Bengal Fire and Red Fire in Part IV.

OTHER EXPLOSIVES.

Dynamite.—Mix intimately infusorial silica, 100 ; nitro-glycerine, 75. Will explode with percussion.

* If a combustible gas be mixed with sufficient air to provide all or nearly all the oxygen necessary to burn it, an explosion takes place because of instantaneous combustion which produces great heat to expand the gas enormously, *e.g.*, gasolene, benzene, hydrogen, coal gas and marsh gas in mines

Crackers.—Realgar (q.v.), 2 ; potassium chlorate, 1. Powder in separate mortars. Mix gently with a spatula. Make small parcels, along with bits of kankars in paper. Wrap round old rags. Wrap with coloured kite paper.

Too much emphasis cannot be laid on powdering the ingredients quite separately. Want of precaution has lost many precious lives.

Gunpowder (blasting).—Saltpetre, 62 ; sulphur, 20 ; powder of charcoal, 15. *See hint on crackers above.*

Gunpowder (sporting).—Saltpetre, 79 ; sulphur, 9 ; charcoal, 13.

Nitroglycerine.—Add sulphuric and nitric acids on glycerine slowly at low temperature. *Proportion :*— Sulphuric acid, 44 lb.; nitric acid, $2\frac{1}{3}$ lb.; glycerine, 1 lb. The product will be precipitated and can be washed by plenty of water very carefully. The rapid change from liquid to gaseous state explodes the mixtures.

Gun Cotton.—Pure dry potassium nitrate, 9 ; sulphuric acid, 60 fluid ounces. Mix. Let cool completely. Gently add $7\frac{1}{2}$ ounces of fresh cotton wool. Stir. The moment the cotton is fully saturated, throw the cotton into a big tub of clear rain water or distilled water. Boil out water and wash till no trace of acid is visible. Acid turns blue litmus paper red. Press out water. Dry at a temperature always below 140° F.

This product must be handled with great caution for it is an explosive.

CHAPTER XXVI.

MILLIONS FROM WASTE PRODUCTS.

TAP THESE RESOURCES : POSSIBILITIES OF MAKING MONEY.

What vast fortunes can be made by those who can avail themselves of the opportunities as they arise and are not slow to invest their capital. A certain London merchant became a millionaire by collecting rags of cotton cloth and turning them into big cables. Large quantities of various surplus chemicals from the first Great War should have been thrown away, had not the analysts come to the rescue. Large factories as

well as cities are throwing away many valuable bye-products which could yield gold as the magic touch of a man knows how to utilise them. Hereunder we give a few indications :—

Saving Material.—Economy to-day is a deed to patriotism. The saving of labour and economising in materials is demanded from all sides.

A big saving on tools can be effected with care. Used up saws, too, may have a greater value than they will bring as part of the scrap. The steel used in the saws is of high quality and well tempered. These may often be used in making light tools or in experimental and special work. The old worn out high-speed steel tools can be cut to proper size and utilised for tips at a great saving by welding high-speed steel tips. This is done as follows. The high-speed steel tip is first "tacked" to the machine-steel shank and the whole preheated. After fusing with borax, welding is started. After welding, the tool is immediately laid in mica dust to cool gradually. It is then given a first grinding and tempered, after which the finish grinding is accomplished, when the tool is ready for use.

Aluminium is another metal in which economy is absolutely essential. The high loss by the usual method of melting the chips is due largely to the difficulty in getting the molten globules to unite. This difficulty is experienced when the chips are originally coated with a layer of oxide and dirt.

There are two methods of melting the chips which will aid the mixing. One is to keep the chips at a temperature slightly higher than the fusion point and help the coalescence by mechanical mixing or hand puddling. An iron pot heated by oil is perhaps the best means for melting.

The second method of melting is by using a flux which will remove the skim of dirt and oxide and produce clean globules which will readily unite. A flux of 85 per cent. common salt and 15 per cent. flourspar, used in an amount equal to 20 per cent. to 30 per cent. of the weight of the chips, is recommended.

The amount of waste aluminium scraps may be reduced by using greater care and cleanliness in the

collection and storage of the chips. Dirt and oxide are the cause of a low percentage of recovery and if these are guarded against more aluminium may be recovered. How one factory made a profit from its scrap heape! In the factory work is divided into two classes, namely. castings (either steel, brass, or cast iron), and steel parts (bar, stock, or forgings). A helper comes through the department every day with a hand truck and collects the material spoiled the previous day, keeping the two classes in separate boxes.

All the pieces so accumulated are taken to an inspection department, where they are given a casual inspection with a view to determining whether they are of any use or not, castings which have been spoiled by incorrect machining are set aside for use in repair work or replacements, whenever the injury is such that it does not vitally effect its usefulness.

For example, a machine pulley which has been chucked with an oversize hole may easily be brushed so that it can be used on repair or replacement work.

Forgings which have been spoiled by careless work are usually scrapped, unless they can be used in replacement work, but pieces of bar-stock cut undersize or with a shoulder incorrectly placed are sent to the screw department to be used up on short jobs whenever their length is such that they can be used to advantage.

It is very hard for inspectors to allow just the right amount of variation in parts under process of final inspection. An occasional supervision over inspectors' work preserves correct standard. Before ordering new material for a job it is essential to look through the scraps. The foreman should see if it contains any material that can be used. This almost daily going over keeps the scraps down to a very small amount. The parchings and trimmings which cannot be used up in this way are sent to their foundry.

Benzol from Coal Waste.—Near the collieries large amounts of coal are even in handling the commodity reduced to powder and small pieces which cannot be sufficiently burnt. These waste products can be readily turned into benzol which can take the place

of petrol, for which we are paying so heavily. Indeed the importation of petrol and motor-cars in exchange for the hard earned money of the ryots accounts for our weak monetary position ; so too the slump in the market and the huge figures of present-day unemployment as also the war expenses thrust upon India.

Bricks from Spent Shale.—The utilisation of spent shale for building purposes is being carried out at West Lothian (Scotland), where the large heaps of spent shale from oil mines are being converted into material for the construction of houses.

The shale is crushed to a fine powder, and mixed with finely screened lime in the proportion of about 8 per cent. lime to 92 per cent. of shale. These two ingredients are then mixed with water, and the bricks formed for the mixture by means of hydraulic pressure. This is the first attempt to use the waste shale, and the resulting bricks are said to be superior to those made from clay.—*Industrial India.*

Building-stone from Cork Waste.—Cork waste is mixed with cement, sand, clay lime, solution of water glass, and hair, and with the addition of sufficient water to turn it into a plastic mass, pressed into moulds and dried in the air.

Buttons from Waste of Horn.—The waste is powdered by cylindrical grater. The powder is then transferred to cylindrical moulds, subjected to great pressure, at the same time increasing the temperature. The hot button cylinders are at once cut into discs of the desired thickness.

Celluloid Scraps.—So far no attempt seems to have been made to make use of the celluloid scraps of broken toys, etc. If regular depots be opened to collect these scraps in chief centres, an industry hitherto unexplored can be set up in India, paving the way to the opening of celluloid manufacturing factories. There is no end to the raw materials in India for making this product (*vide* Directory) and Chapter XVIII on toys. What is most needed is enterprise.

Charcoal Waste.—Charcoal making in India is at the present time in ignorant hands who ply their job, in the age-long way. Not only the heat produced in

burning wood is lost and not put to any use in any factory nearby, but no effort has so far been made to produce wood vinegar and acetic acid (see Part IV), and we continue to depend upon the West; that again and again by internecine wars to stabilise the tottering edifice of imperialism or to further any other ideology, which should be none of our concern, upsets the Indian economic equilibrium. Moneyed men should acquire interest in the hills (in the Punjab, height about 5,000 to 8,000 ft.) where hard woods like oak, beech, etc., grow abundantly, and set up small factories for the production of acetic acid and methylated spirit, the charcoal left in the retorts being used by all the hill stations.

Efforts have already been made by enterprising young men in collecting charcoal dust from the town shop-keepers, and by mixing it with some cement and molasses and powdered cinders from engine sheds in manufacturing *laddu koela* (ball charcoal). Hard laddus are made with a die which is almost like that used for stamping soap cakes.

Chicken Feathers.—Remove the stems and place the plumes in quantities in a coarse bag. When quite full, close and knead briskly with hands for about 5 mts. when a perfectly homogeneous and very light down is formed, lighter than eider-down. This material fetches 20 francs for 2.2 lb. in Paris. It forms best material for upholstery, and if woven a beautiful cloth can be obtained. The cloth is said to be indestructible, water-proof, and wears very long.

Energy, Waste of.—Millions of able bodied mendicants in the guise of *sadhus* and paupers roam about and consume so much food for no service rendered by them. Pressure should be brought to bear upon the Legislatures to put an end to this objectionable able-bodied pauperism. Some of these *sadhus* grow so fat that we are tempted, if we could be allowed a free hand, to harness them to flour and oil mills or to printing presses.

Much of the mechanical energy of the mountainous torrents is being wasted away annually, because the poor hill people have neither funds to invest nor adequate knowledge how to start small cottage industries like

those in Switzerland or Japan. For all this our mental, moral and political slavery is largely responsible. To look to an alien bureaucracy that is more interested in the benefit of its own pockets or in guarding the vested interests of its kith and kin, for any help is worse than useless, aye, hoping against hope. The strong resistance offered by the Government of India to the starting of industries like aeroplanes, motor-cars and locomotive engines building is a case in point.

Since the publication of the first edition of this work, the Government of the Punjab has at great expense to the public tried to harness the waters of Uhl River in Mandi State, but sad to say for want of clear perspective and rabid communalism of the Punjab Government, the scheme has so far failed to pay. Unless the whole scheme result in the spread of a network of cottage industries requiring small outlay of money, and thus relieve unemployment, several crores of rupees that would have otherwise relieved the burden of the tax-payers shall have been wasted.

Fibres from Different Plants.—The process consists in cleaning and cutting in small pieces the plants and macerating them in caustic soda lye of 10 Beaume when on hystrostatic pressure being applied, the fibres burst out.

Fortunes from Bobbing.—Parisian hair-dressers are rapidly becoming millionaires.

Their rapid rise to fortune is the outcome of the bobbed-hair fashion, which has caused an increase in the number of elaborately fitted hairdressing establishments reserved wholly for women from 20 in 1914 to more than 500 to-day.

Fashionable hair dressing saloons are being sold and resold at continually soaring prices, and it is said that some women's hairdressing businesses have changed hands at as high a figure as £102,000.

"For a large West End establishment," said a London hairdresser, "£10,000 to £15,000 would be quite an ordinary price to-day."—*Indian Telegraph.*

Glue from Lasooras.—*Lasooras* (Cordia major and minor) yield so sticky a cement as beats hollow all others. In midsummer when this fruit ripens, the

juice should be gathered in big open-mouthed bottles and as a preservative a few drops of oil of cloves or formaldehyde or a pinch of boracic acid added. It can be sold in small bottles.

Glass, Broken.—Can be used for filtering, in the manufacture of matches and for sand-paper, and can be remelted to manufacture cheap bangles. Glass powder is extensively employed for preparing yarn for kites.

Glycerine from Soap-makers' Lye.—The lye is neutralized and sufficiently evaporated to precipitate the salts which are removed and washed with neutralised lye. The fluid is again evaporated and mixed with a little more of oleic acid than the glycerine present. The compound is first heated in a still to 338° F. by steam and then gradually to 392° F., the air being excluded by the introduction of carbonic acid. The still should be provided with a stirrer. (The lanolin so formed is saponified with lime.) A solution of glycerine in water so obtained is evaporated to dry.

Glycerine may be prepared in the utmost purity by the following process. If we take equal parts of olive oil and finely ground litharge, put them into a basin with a little water, set this on a sand-bath moderately heated, and stir the mixture constantly with the occasional addition of hot water to replace what is lost by evaporation we shall obtain, in a short time, soap or plaster of lead. If after having added more water to this we remove the vessel from the fire, decant the liquor, filter it, pass sulphuretted hydrogen through it to separate the lead, then filter afresh, and concentrate the liquor as much as possible without burning, upon the sand-bath, we obtain glycerine; but what remains must be finally evaporated within the receiver of the air pump. Glycerine thus prepared is a transparent liquid, without colour or smell, and of a syrupy consistency. It has a very sweet taste. Water combines with it in all proportions.—*Anon.*

Hair Short, Utilisation of.—Wool, etc., can be made suitable for spinning, weaving and felting by treating it with a thin alkaline solution and then with dilute acid.

Methyl Alcohol, Pure.—Alcohol and acetone are mixed intimately. They have low boiling points, and so they cannot be separated by simple distillation. Alcohol is treated with chlorine, which combining with acetone, forms chloracetones which have higher boiling point than methyl alcohol. So the latter can be then separated by distillation at a low temperature.

Mango Stones—Can yield blue black colour. Also for making starch (See *Industrial and Other Openings for Youngmen.*) Also for pyrogallic acid. *To extract the colour*, remove the hard kernel and dry the inner pith. Reduce to powder in an iron mortar. Boil with water in an iron kettle. Strain.

Milk Sugar from Whey.—Whey can be abundantly had from dairies and to a certain extent from the halwaies that manufacture butter. Neutralize the whey with whiting, evaporate to one half, and let settle. Draw off the clear whey and further evaporate, when the sugar separates. 100 parts of summer whey can be made to yield 4 parts of lactose by repeated evaporations. In winter, whey should be cooled by a freezing mixture. (See Index.) The crust of ice removed from time to time will carry away fat, albumen and salts. In winter, whey can be had very abundantly as then people make very little use of butter-milk.

Molasses. Utilisation of—Except where a Schharate process is used there is always a residual quantity of the molasses from the beet. Cane sugar factories always produce a final molasses, the average quantity of which is about 4 to 6 gallons per ton of cane in tropical factories making raw sugar. Cane molasses is utilised in rum and alcohol manufacture and in stock feeding and in making alcohol. The residue from distilleries of Europe is concentrated and the organic matter is burned, leaving an ash very rich in potash. Sulphuric acid is added to the mass before burning to reduce the loss of the nitrogen. The ash is used as a fertilizer.

Cane molasses of good colour from the manufacture of white and high grade yellow sugars is used in the baking industry and as a table syrup.

There are many small industries in which molasses is utilised.—*Industry.*

Coal Dust, Money in.—The leading-strings of our Government being in the hands of Whitehall beyond the seven seas and what it stands for, Bengal Coal Company, a foreign concern, has the largest interest in coal-mines in Bengal. Though our country produces only 28 million metric tons of coal a year which is a little less than one-fourteenth of United States of America, a little less than one-tenth of U. Kingdom, and little less than one-eighth of Germany, India will long remember the shortage caused during the Second World War which told very badly on the masses who had to get fuel at exorbitant prices. Coal should not be looked upon as merely the source of heat; the number of drugs and dyestuffs that are produced from coal is legion, and yet the pity of it all is, thanks to the bureaucratic imperialism, that still in this twentieth century when the lessons learnt during the first Great World War should not have been forgotten, our princely government did nothing during the interval to make the fullest possible use. According to some statisticians, in Jharia coal-fields alone, so much coal dust is being wasted in a year as should yield 30 million gallons of coal tar, the basic material from which so many colour dyes, medicines and other chemicals are made. It is high time for capitalists that find no suitable jobs for their sons or invest their capital in 3% concerns to turn their attention to this unploughed field. Geologists tell us that there is buried according to our present knowledge 60,000 million tons of coal under Indian soil and at the present rate of mining, it will suffice us for 2,000 years to come. What great source of petrol it is; could we take steps to make the fullest possible use of hydro-electric power, and stave off the use of coal, so that future generations should have resources enough and to spare for dyestuffs, etc., our stocks could last for 3,000 years.

Dung, Money in.—Money in dung? Yes, money in dung. Actual experiments have shown that cattle dung and cattle urine—see "Storage of Cattle Urine and Dung, Chapter II—are very good fertilizers. An acre of land without being manured used to give 1,374 lb. of grain and 2,174 lb. of straw. After cowdung had been used, it yielded 3,556 lb. of corn and 4,779 lb. of

straw. When, instead of dung, bonemeal and nitre were added to the soil, the crop rose to 4,389 lb. of grain and 6,178 lb. of straw, *i.e.*, the same piece of land yielded thrice as much. Just think for a moment how much more money can it bring to the famished and half-starved ryots who from one end of the year to the other for want of proper means lead a miserable existence and are burdened with family cares and anxieties, distressed with plague, pestilence and epidemics, and squeezed by the corrupt officials, sucked white of their precious life-blood by the shylock of a moneylender, and thirsting for two square meals a day in times of drought and scarcity. It means, if anything, that a kisan owning no more than an acre can earn even with cowdung Rs. 83 more by selling his additional yield of corn at the rate of five seers for a rupee and Rs. 7 more for the additional straw, *i.e.*, Rs. 90 in all, by no means a small sum for the indigent and poverty-stricken farmer. The question of course arises what should the farmer burn for fuel, for at present he burns the dung. It has been suggested that pieces of land should be set apart in every village to grow trees on for firewood. They can also grow trees on the borders of their fields provided such trees, *e.g.*, acacia (kikar) do not interfere with the productivity of the ground underneath. One such tree is the country (zizyphus jejuba). It yields excellent timber and good charcoal and wood with sufficient calorific value, of course not as much as of acacia, beech, oak or jand. But it may be objected that trees will take time to grow. What should the poor farmer do in the meanwhile? Somebody must come to his rescue. Nothing can of course be done during the wartime, but as soon as the war is over, the cry of census people that India cannot grow enough for all hungry mouths that are fast added from year to year should become a reproach to the Agricultural Department, reproach to the Government Publicity Department, and a reproach to the Government that claims to march abreast with the times, *i.e.*, claims to be progressive. If the Government of India can " beg borrow or......and can resort to inflation upto Rs. nine hundred crores in 1944 which bids fair to soar high to the reputable or disreputable figure of ten hundred crores at no distant future, why cannot the same government finance the farmers to tide over

the difficulty pointed out above? Had the Government exercised foresight, Bengal would not have paid a high death toll to Starvation and Death. The danger of further inflation can be combatted by stopping all kinds of satta-gambling and all kinds of forward business that have ruined many and very prosperous markets. Satta-gambling brings money to the coffers of the grain corporations, to those who finance the scheme, to those who are favoured by fortune, to some brokers who have nothing at stake and to the Telegraph and Telephone Departments but to the country as a whole it means dire distress and misery. It locks up the surplus capital in unproductive operations, and it impoverishes the nation building industries. Once those who are plying this nefarious, abominable and nation-killing trade are deprived of this easy but uncertain source of income, they shall have to fall back upon financing the village co-operative societies, key industries without which the marginal wealth of India is being drained every year by foreigners, and in financing schemes like the above The Editor of this book has no patience with the vampires of shylocks, no patience with those engaged in satta-gambling.

The scheme envisaged above shall require the heretofore unproductive investors, *e.g.*, the satta-gamblers, the shylocks, and those engaged in buying and selling shares, not for financing the new issues, but of companies already existent for the beggarly marginal profit of one or two per cent to invest their capital directly or indirectly in raising the total produce of the land, directly by helping the ryots themselves, the Government standing security for the return of money with so much per cent of interest or with half the value of the additional yield, and indirectly by financing the rural co-operative societies for the express purpose of financing this scheme, the Government again standing security for the safe repayment of money with interest at a stipulated rate. If anything stands in the way of this scheme it is the old and out-of-date ways of thinking which must go lock, stock and barrel, if India is to prosper and if India is to take a deserved place in the scale of the nations.

Oil Waste, Recovery of.—The following is the average composition of dirty oily rags from garages :—

Dirt, moisture and other foreign matter ..	33%
Oil	22%
Clean rags	45%
	100%

The following is the process of cleaning oily cotton waste or cloths, and recovering the oil. The oily waste is placed in a centrifugal extractor to recover the oil, then the dirty waste is washed in a special washing machine ; and finally the washed waste passes back to the centrifugal machine, and then on to a dryer, where the process is completed.

In cases where only small quantities of waste are to be dealt with, a very interesting combination machine is used, which takes the place of the turbine centrifugal extractor and washing machine. This eliminates the necessity of having two separate machines, for in the one machine the material can be de-oiled, then washed, and afterwards water extracted, when it is ready for dyer.

This combination extractor-washer consists of a cast-iron shell, with base, having a central column, in which runs a vertical steel shaft mounted on ball bearings, carrying a perforated steel cage fitted at the bottom with turbine blades. Removable wire baskets which fit into the perforated steel cage are provided for holding the material.

For oil extraction, the basket with material for treatment is lifted into the machine, and the oil outlet is opened. Steam is turned on to the driving nozzle and, playing on to the turbine blades, rotates the cage carrying the basket of material and the centrifugal action, combined with the heating effect of the steam, which exhausts through the material, separates the oil or fat from same and it runs down through the oil outlet.

For boiling or washing, the de-oiled material is pulled down from the sides of the removable basket, the cover put on the machine, and both oil and water outlets closed. Water is turned on into the machine, and a small steam supply only to the driving nozzle, so that the basket rotates slowly while steam is turned

on to the boiling nozzles, which, playing through perforations in the bottom of the revolving cage, agitates the material and boils the water. The drying of de-watering process after washing is similarly performed to oil extracting, only the water outlet is opened, and the oil outlet closed.

When large quantities of waste material are to be dealt with, separate machines are used for each operation, and the general outline is as follows :—The first machine is the turbine centrifugal separator for de-oiling the oily waste, and the general construction of this machine is similar to the one described above.

From the centrifugal separator the de-oiled material passes to the washing machine, which consists of a horizontal perforated cylinder, capable of rotating within a suitable casing so as to be capable of receiving the necessary steam and water supply. The general features of this machine are very similar to those used in ordinary laundry work.

Another portion of a complete plant is that which deals with the extracted oil. The design of this apparatus depends upon the nature of the oil.—*Industrial India.*

Orange Peel, Utilisation of.—This can be utilized for the extraction of otto. Similarly lemon and lime rinds can also be utilised. All of them can be used in making *batna*, skin creams. Citric acid seems to have a very healthy and beneficent effect on the skins, imparting to it a radiant ruddy glow and keeping away old age.

Paper from Cocoanut Husks.—The outer rind of cocoanut husk is of a very liquified character. Inside this rind is a pithy structure about two inches in thikcness interlaced throughout with very strong, long fibres of a jute-like, liquified appearance. In the boiling treatment of the husks, two large samples of the selected material are dried at a temperature of one hundred centigrade, and then accurately weighed. The outer rind of the one is then pulverised and the other is left in its original condition. Each sample is then placed in a separate bag made of Hessian cloth, and boiled for four hours at a pressure of thirty pounds per

square inch, with 18 lb. of sodium peroxide per cent. in separate boilers along with the esparto grass. When the boiling operation is completed, the husks are examined, and it is then ascertained that this treatment is not sufficiently drastic to destroy the pithy constituent in the rind, while the latter is scarcely affected or softened by the boiling. These results proved that to separate the cellulose from the non-cellulose portions of cocoanut husks much higher temperatures and pressures would be required. The sample of cocoanut husk in which the rind is broken up is resolved to a greater extent than that left untouched. Further experiments are, therefore, carried out with the former husk. It is treated with 36 lb. of bleaching powder per hundred weight; but even with this excessive portion of bleaching agent the husk is but slightly whitened, which is another proof that the boiling process is not sufficiently prolonged or severe. To prepare a suitable paper-making material from such a waste as cocoanut husk is obviously very difficult if not impossible, but laboratory experiments are to be continued with a view to giving the material a further chance.—*Indian Review.*

Paper from Straw.—The shortage of paper during the War opened the eyes of the British people to the possibility of manufacturing cheap grade paper and straw-board paper from straw. Large quantities of straw are run to waste in the Punjab colonies. It will be much to the advantage of the capitalists to set up one such mill in Lyallpur or Montgomery for this purpose. Straw for this purpose should be finely chopped. It is then boiled with chemicals and then bleached.

Another promising source for the production of paper is husk from the oat which is thrown away by the mills. In this way about 35% material is lost. Experiments made show that the husk being ground down finely can make low-grade papers for packing and for printing cheap literature. "Paper so made is composed of oat-husks, 35 per cent.; waste-paper, 50 per cent.; imported pulp, 15 per cent."

Papier-mâché, To make.—Collect book-binders' shreds of paper. Boil them in clean water. Beat them into a paste. Add glue, or size or gum which

has been boiled and press into moulds. If fengureek be mixed with the glue, extra strength will be imparted.

Patent Fuels.—There are a good many patent processes for the preparation of fuels, but 'charbonette,' which has recently been brought out by a French inventor, is stated to be produced for about-two-thirds the cost of coal. It lights easily and rapidly, becoming incandescent, no smoke is emitted, while at the same time it gives out intense heat and leaves scarcely any ash. It is manufactured in briquettes and its main features are cleanliness in handling and the absence of smell. It is stated that the preliminary tests have been so satisfactory that a factory of forty thousand tons annual output is to be erected. In the second case the fuel is of the liquid type known as 'masut' and is one of the bye-products of petroleum distillation. Among its advantages are stated to be great heat-yielding qualities, accompanied by little smoke and it is already in use among certain European navies. This product is stated to be easily obtainable from oleferous tertiary coal beds, and for this reason its manufacture should be susceptible of extensive development in Great Britain especially among the shale-oilfields of Scotland.

Peach Stones, Oil from.—Peaches grow abundantly in India. No use is, however, made of their stones. If sweepers be given directions to collect, they can supply basketfuls of stones. The stones should be first dried, and then got crushed. The soft seeds should be placed in oil mills to get the essential oil which can be used in place of oil of bitter almonds for making soaps ; for earache, or for watch-repairs.

Pine Needles—Should be boiled with lime, soda or potash, until reduced to a fibrous state. The stuff can be used for upholstery instead of hair or feathers. Has the advantage of being immune from bed bugs, running moths, fleas, etc.

Potash and Phosphate of Lime from Cotton-seed Hulls.—Burn the hulls to ashes. Boil the ashes in ten times as much water for about 2 hours. Add lime, half the weight of ashes and let settle. Syphon off the clear solution. Put the residue in a percolator and exhaust with water ; add the solution to the clear liquid ;

evaporate both to dryness ; fuse the potash in a furnace and run into moulds. Repeat the process of exhaustion. The residue in the percolator contains 50% of phosphate of lime.

Potash from Washing of Sheep Wool.—In France various woollen factories obtain about 100 tons of potash from this source. The wash water of large woollen factories is boiled down to dryness ; calcined ; by percolation of water separated into soluble and insoluble parts ; and crystallised. It has been estimated that if France could utilise all the waste water from so many woollen factories in the country, she will not require any potash from outside. Wool gathering centres should try to extract potash by washing the wool before sending it to woollen factories in the country or abroad.

Prison-Waste.—The energies of all intelligent Indians, save those who are employed in Government and semi-Government departments, are being wasted in waging a never-ending war with a foreign bureaucracy to wrest from her the political power without which financial independence cannot come to India. England has always been bent upon having the largest number of safeguards in the constitution foisted on India from time to time. This implies further friction between the two countries and further waste of precious money, precious energy, and may be precious lives. The Governments of both the countries are absorbed in unravelling this political tangle, and huge reserves of man-power, not the least of which is the man-power of prisoners, are being run to waste. The main secret of Japan's success-supplying articles in the different lines at so cheap rates as to push out all Western competitors out of the market-lies in her utilizing her man-power to the fullest extent. There neither the women nor the boys idle away their time as we do in India. All of them work and produce such an over-abundance of manufactures that even the most industrialised Germany found it difficult to hold its own in the eastern markets. While the bears and lions of European nations were busy fighting, the fox of Japan was strengthening her position, her industries and her technology, and she has since made such rapid advances that other countries have been obliged to raise huge tariff walls.

Rasaunt from Barberry.—Rasaunt so largely used in medicine is an impure watery extract of barberry bark and wood. The tree grows wild on the lower heights of the Himalayas. The watery extract is purified by dissolving it in proof spirit and then evaporating to the consistency of treacle.

Barberry bark may also be administered in the form of a decoction. For this purpose boil slowly chopped or coarsely powdered root 6 oz. with water $2\frac{1}{2}$ pints and reduce to 1 pint.

Rubber, Reclaiming of.—The following is an outline of a process described in English Letters Patent : The caoutchouc, cut into shreds, is first heated in vacuo to 100°C. (212°F.) along with 5 times its own weight of commercial (crude) phenic acid. By this boiling the sulphur is partially transformed into volatile products and thus eliminated partially by precipitation by lead acetate. The caoutchouc is then precipitated by the addition of some solvent of phenol such, for instance, as alcohol, sodium hydrate, etc., and is now in a condition for immediate revulcanization.

Sawdust as Fodder.—Sawdust for breakfast has materialized as an actual fact, but for cows rather than for human beings. Cattle do like it, however, and on the basis of the state of supply and cost of production, sawdust is not yet a practicable source of nourishment even for cows, according to a report by J. G. Archibald. —*States Science.*

To render the sawdust available as a cattle food it is treated with weak sulphuric acid which converts part of the cellulose, the basic chemical constituent of all wood, into sugar. The liquor resulting is neutralized with lime and then evaporated to a thick syrup, which is finally mixed with the dried residue. The product when ready for feeding is a dark brown powdery meal with a sweet woody odour and a woody flavour.

But, alas! no sensible dairy cow could be persuaded to eat more than four pounds daily and produce less milk than when fed on from one-half to one-third as much corn starch.

Sawdust for Plaster.—It is claimed to be much lighter and to stick more firmly. Use the following

mixture: Slaked lime, 9; sawdust, 2; gypsum, 2; glue, $\frac{1}{2}$; glycerine, $\frac{1}{8}$. A chemist has also succeeded in manufacturing sugar from sawdust by the action of sulphurous acid. Sawdust with the above or any-other cement may be subjected to great pressure to fill up hollows where wood cannot possibly be used. A special furnace has been devised for burning saw-dust.

Shoemakers' Waste.—See manufacture of Glue. (Consult Index.) The waste of skins can also be employed for the manufacture of *Printers' Rollers.* The waste is cleaned by soaking in water for several days; cut into small pieces and covered with glycerine; boiled for some time at 212° to 235° F. When all the waste has been dissolved, the solution is transferred to another vessel, allowed to cool, and then poured into moulds.

Silk, New, from Old.—It has long been the practice to work up discarded woollen clothing and woollen rags of all sorts into a cheap fabric known as shoddy. Hitherto, however, no way of treating silk to produce a made-over fabric has been known. Die Umschau (Frankfort) announces that the Russian scientist, Professor von Weimann, once resident in Japan, has devised a successful method of treating silk so that it can be similarly employed to produce a made-over fabric.

Silk scraps from underwear, dresses, ribbons, hosiery, tail-ends of cocoons and the like, as well as the waste swept up in factories, are dissolved in a hot concentrated aqueous solution of a readily soluble neutral salt, producing a gummy fluid. This liquid is transformed by the addition of concentrated aqueous solutions of other chemical salts or alcoholic solutions into a gelatinous state, passing into a plastic viscous mass, which can be spun into new threads like artificial silk.

Straw, Utilisation of.—Most straws, *e.g.*, maize straw, corn leaves and stalks, oat straw, barley straw, wheat straw, and rye straw can be readily turned into paper pulp, by the action of potash and lime. The straw of any corn can serve as an excellent manure for the crop of that very corn.

Sugar Manufacture, Waste from.—The waste product which has been transformed in bagassee, the

fibrous residue of sugarcane after the juice has been extracted formerly, was burned under the boiler of the sugar mills, not because it is a good fuel, but because there was no other way to get rid of it.

By the process just perfected, the bagassee is fed into a cooker, where it is combined with chemicals and small amount of old newspaper, and then as a pulp is fed into rolls, and finally into an enclosed drier, coming out at the end an absolutely dry board.

The effect of this constructive process in making something worth while out of former rubbish is to bring thousands of dollars to the planters, create thousands of tons of freight for railroad and steamship line and to reduce the cost of building operations.—*Home and Homeopathy.*

Tailors' Waste.—If arrangements be made with tailors they can go on storing their rags instead of throwing them away or firing them in stoves. Rags from warm apparel can be used for upholstery and for polishing, while rags from cotton clothes can be properly treated to make celluloid (*See Celluloid Toys.*)

Tin-makers' Waste.—This can be easily utilized in the manufacture of tags. If buried in pit and allowed to remain there for a large number of years iron would again become an ore which can be smelted.

Tin-plate Waste.—Now-a-days most of the tin is extracted from tin-plate waste, and the cuttings of tin-plate. In the extraction of tin the process of electrolysis is employed. The electrolyte consists of a soda solution and the waste forms the anode. The tin becomes oxidised and is then dissolved in the electrolyte. The hydrogen thereupon reduces the oxide and the metallic tin is deposited on the cathode. The iron freed from the tin may subsequently be used again. —*Indian Review.*

Turpentine from Pine Waste.—The production of turpentine from yellow pine waste has been studied by the Forest Service through its section on Wood Chemistry. It is found that for the recovery of turpentine from waste wood, the steam distillation process is far superior to destructive distillation, making a more

uniform crude turpentine and usually a higher grade of refined product. The Forest Service states that the wastage from the yellow pine cut each year would yield as much turpentine as the entire present output in this country, with a value of some $14,000,000. They further assert that at the present rate of cutting, the supply of long-leaf yellow pine in the south will be practically exhausted in twenty years, but that methods of exploitation now in use convert only about half the tree product. The importance of waste utilization is based on this fact. The study of turpentine production will be continued by the service in the belief that there is no reason why steam (waste wood) turpentine should not bring at least as high a price as gum turpentine.—*Indian Review.*

Winds, Harnessing of.—Along the coast line of India, steady winds blow all the year round and offer a vast scope for setting up a net work of windmills that can give a sturdy independence to all the coastal cities like Karachi, Godavari, Surat, Bombay, Calicut, Madras, etc., so far as consumption of coal, petrol, and firewood is concerned. The energy generated by the windmills can replace that produced by other agents. How vast is the prospect of setting up cottage industries there. Only a truly national government can fully make use of these hidden treasures and make all transport difficulties a thing of the past. So long more coal deposits are not discovered, we should conserve our present coal deposits for coal products and for aniline dyes, whenever factories for manufacturing such articles be set up, all the requisite power for the household, for the factories and for transport being supplied by electricity. The Indian Desert too shall have at no distant time to be harnessed to add to our resources of producing energy.

Wood Pulp, Making of.—Wood pulp is made by cutting the wood into small blocks and treating in a boiler with caustic soda or sulphate of soda : the latter is now largely employed, owing to its cheapness. Steam is passed in under pressure, and helps to disintegrate the wood. The action is allowed to go on for a few hours, and the pulp is then turned out into a large tank, where it is thoroughly washed with water to

remove the soluble ingredients. The knots and unaltered positions are sifted out.—*How To do It.*

Wood Pulp, Paper from.—Now that hydro-electric energy bids fair to be available at cheap rates, it will pay capitalists to acquire interests in Kangra Valley where soft woods like *partal* (soft pine) are available and send it in wet form to paper mills below.

Wood, Utilisation of.—The only use that the waste of wood is put to in India is to burn it. When we have plenty of coal and coke and when they supply so much more heat than wood, it is simply wasteful to burn wood for fire. From wood we can derive methyl alcohol, acetates, acetone, turpentine, wood oil, and oxalic acid, besides charcoal. The yield of all these products depends upon the specific gravity, the quality of wood, and the way in which the destructive distillation for obtaining the above articles is carried on.

Different kinds of wood have different specific gravities. Cork is the lightest wood. Among the pine trees, *partal* is the lightest. The weight of wood varies with the manner in which it is piled up. In the usual pile about 44 per cent. of space is vacant.

The wood for the destructive distillation should be as dry as possible. It should be seasoned for sixty-eight months, for even seasoned woods contain from 12 to 25 per cent. of water. This water too should be evaporated to get good results. For the manufacture of charcoal and alcohol, and acetates, any kind of wood may be used, but as a rule hard woods give a much higher yield. Wood oil, turpentine and tar can be distilled only from resinous woods like *cheel* and *kelon.*

See also Acetic Acid (see Index)

Apparatus for Destructive Distillation.—The apparatus required for the destructive distillation of wood consists of :—

1. Retorts or ovens in which distillation is carried on.

2. Condensers in which the condensable vapours are liquified.

3. Stills in which crude products are separated, concentrated and purified.

4. Mixing pan for the preparation of acetate of lime.

5. General apparatus such as evaporating pans, storage tanks, coolers, pump, etc. Condensers are the most important apparatus. They should be big enough to condense all the products even under the most unfavourable conditions as the materials lost at this stage can never be recovered.

General Process of Distillation.—Retorts that can hold 1 cord of wood at a time are employed for the destructive distillation of the wood. They are heated slowly, and heating is continued for twenty to thirty hours according to the nature of wood. The flow of liquor and the heating of the retort from top to bottom indicates the progress of heating. When the whole front of the retort has attained a uniform temperature, the supply of fuel to the furnace is discontinued and the fires are allowed to die down. When the retort is sufficiently cool, charcoal is removed.

Hard-wood does not part with the above products until a temperature of 150° C. has been obtained.

(1) Destructive distillation yields 20 to 30 per cent of gases that cannot be condensed, 53% of these being carbon dioxide; 38% carbon monoxide, a very poisonous but inflammable gas and so made use of in burning it under the retorts; and 3% nitrogen, hydrogen, etc. (2) Then there is 20 to 35 per cent by weight of the wood taken, charcoal, the quantity depending upon the quality of the wood taken and the way in which the manufacturing process is carried on. Charcoal is used either as fuel or for the manufacture of charcoal, iron, for which purpose it is highly useful, or on a small scale as refiner or absorbent. (3) 5 to 20 per cent of wood tar and oil are given off. The wood tar is a thick, dark coloured, and sticky liquid, containing some residue of acetic acid. It is chiefly used for preserving wood, for making roofing felts, as an antiseptic, for the manufacture of waggon and other low grade lubricants. When crude watery distillate is distilled for the first time to separate alcohol, acids, and acetone, from the tar, some of the light oils contained in the distillate distil with the acid and alcohol and

remain in the alcohol still. If the distillation be carried on further, they pass over in the last stages and separate in the form of oily layers. (4) Besides the foregoing products there is 30 to 40 per cent of aqueous distillate or crude pyroligenous distillate from which methyl alcohol and acetic acid are extracted. The crude pyroligenous acid is not neutralised. It is distilled from the tar that it contains. When this tar is distilled it parts with alcohol, acid, and other volatile components. Only tar is left behind. It is carefuly neutralised with milk of lime and distilled, when aldehyde, alcohol, and acetone, pass over, while lime retains the acetic acid in the still. This residue is technically known as gray acetate of lime. This consists of from 8 to 10 per cent of methyl alcohol, acetone (methyl acetate), some acetic acid, oily hydrocarbons, and ketones.

CHAPTER XXVII.
MISCELLANEOUS.

Unclassified Recipes and Processes arranged alphabetically.

A good many processes for making different chemicals required in various industries will be found in Part IV.

Agar Batti.—*Ingredients :* Dry resin or dhoop (grows abundantly in Kashmir hills), 10; rosin, 1; charcoal powder, 3; gum benzoin (loban), 3; nitre (shora) 3; gum arabic sufficient : sandalwood oil just a drop or two. *Process :* Melt rosin. Add gum and other ingredients by stirring to form a viscid mass. Apply to long and thin bamboo sticks.

Aluminium Vessels, How to clean.—When aluminium vessels are left dirty and unwashed, they darken in appearance. The tarnish is due to accumulation of dirt. To overcome this defect, wash each pot in hot water and plenty of soap-suds (froth of soap and water). Wipe clean with a cloth and stand on a hot stove immediately to dry completely. Alkalies, like soda lye, ashes, sodium carbonate, ammonia, etc., must not be boiled in aluminium vessels, because alkalies attack the metal and discolour it. Water containing impurities like that of sewage, etc., will spoil the colour of aluminium, this being due to the presence of ammonia. The inside of aluminium pots

ought to be rubbed over with bath bricks and outside with metal polish. (*See Chapter XIV.*)

An Economical Fuel.—*Ingredients:* Charcoal dust, coal dust or sawdust, 1; sand of any kind, 2; clay, 1. *Process:* Wet the mass. Make balls of the desired size. Heat them well over iron bars. Fire them. Saving 50%. The inventor claims that if the balls be oiled properly and well, no stirring and no fresh fuel will be required for ten hours. The coal dust can be collected from dumps near engine sheds or big factories, just where coal is stacked.

Artificial Grindstones.—(1) *Ingredients:* Small particles of sand or stone; soluble glass; sodium silicate; petroleum. Will bear a high speed without becoming soft. (2) Washed silicious sand, 3; shellac, 1. Melt shellac, and mould in the sand while warm. Instead of sand, emery may be taken. Then it can be used for razors and fine cutlery.

Artificial Teeth.—The civilised man leads an unnatural life, most of his foods being deficient in bone-making materials and so the number of dentists is on the increase. It is said that there are no dentists at all in Abyssinia. For the manufacture of artificial teeth, silica and felspar are finely ground to an impalpable powder. A certain amount of kaolin is also mixed. A thick paste is made of this mixture which is tinted with titantium oxide with salts of cobalt, uranium, manganese, etc. It is then pressed into moulds in which are stuck platinum pins. The teeth so formed are burned in saggars at a temp. of 480° C. until hardened, and enamelled with the same materials. The dentists often re-enamel the teeth with an additional amount of glaze to match the teeth of the patient and refine them.

Baldness (Approaching).—*Pomade against*: Mix to make an ointment, yellow cinchona, 15 gr.; extract of rhatany-root, 8 gr.; extract of budrock root, 2 drachms; oil of nutmeg (fixed), 2 drachms; camphor, 15 gr.; dissolve in spirits of wine, tallow or bone-marrow, 2 oz.; best olive oil, 1 oz.; citron juice, ½ dr.; any perfume as much as desired. *Very valuable for preventing the onset of baldness.*

Beeswax.—Place the honeycomb in a bright iron pan, preferably a tinned one. Add water in the ratio of 1 tablespoonful to each pound of the honey expected. Heat gently again and again with a piece of wire so as to liquify the contents. Do not let honey boil. Remove from fire. Let cool. Lift up now the cake of wax with a knife and remove impurities. *Inferior grade waxes contain a proportion of paraffine.*

Black Teeth, Remedy for.—Powder and mix well equal parts of common salt and cream of tartar. Every morning wash the teeth, and rub them well with the powder.

Blood Purifier.—Distil in the sun for 5 or 6 days, 1 chhtk. cloves, 2 chhtks. cinnamon, 1 chhtk. mace, 1 masha saffron, 1 chhtk. borax, 4 handfuls of petals of rosemary or roses, 40 chhtks of wine. *Dose*: 20 mm. in the morning and evening. An excellent medicine for the fair sex when their blood is impure.

Blue Snow for Chemical Magic.—Prepare some cobalt hydromercurithiocyanate by adding a solution of ammonium, sodium or potassium sulphocyanide (thiocyanate) to a solution of mercuric chloride (Dalchikna or Raskapur) and place it in a tall container such as a wide-mouthed bottle of short size. Then add a solution of pinkish cobalt nitrate. In a short time, a flaky blue precipitate will fall gently through the liquid, slowly settling to the bottom. This precipitate, resembling a blue snowfall, will be the cobalt hydromercurithiocyanate. Wash it and filter. Preserve. It can serve as an excellent chemical stunt.

Bone Meal.—Take a large kettle. Fill it with ashes, and with 1 peck of lime (capacity, 2 gallons) to 1 barrel of bones. Cover with water and boil. It will take from 24 to 30 hours to make the bones so soft as to be powdered with hand. Bone dust being mixed with wood ashes makes the best fertilizer for fields where wheat, peas, beans and other nitrogenous crops are to be produced.

Burning Fluid.—95% alcohol, 8 gall; camphene, 2 gall; camphor, 10 gr.; nitre, 10 to 15 gr.

Boots, To Waterproof.—Place beeswax in a pan. Quite cover it with linseed oil. Melt it over a water

bath. Stir well; let cool. If too thick, add more oil. Apply warm with a stiff brush before a slow fire. Warm the boots and give a second coating. Addition of a little lampblack will improve the preparation.

Burns, Effectual Remedies for.—1. Mix equal quantities of milk of lime and linseed oil. Apply gently. *See also Improved Carron Oil* (next page.)

2. Char broomsticks. Reduce to powder. Sprinkle over the burns. Pain will be relieved in an hour.

3. Mix as much of prepared chalk as can be absorbed in lard. Application of this ointment will not only relieve blistering, but also relieve pain.

4. Sprinkle over the burns talcum powder, or in absence thereof any face powder. Talcum powder has the great advantage of absorbing moisture and so preventing blistering.

5. When hands or any part of the body is burnt or scalded mildly, bury it at once in wheat flour (unkneaded). Its action is similar to No. 2.

6. Slight burns are easy to cure, if the burnt part be quickly heated at a distance from the fire. Like cures like. See also 'Common burns', *inforce.*

Butter to keep for three years.—Powder and mix well first quality common salt, 2 ; sugar, 1 ; nitre, 1 One chhtk. of this salt will be sufficient to cure 2 seers of butter. Work it well with the butter. To be packed in jars or wooden vessels or air-tight cans. Vitrify them all around to exclude the possibility of outside air getting in. It is claimed that butter so kept looks rich and of a fine colour ; does not taste salty ; never becomes brittle or hard ; and can keep three years.

Carbon, How to remove, from Motor Cylinders.—Make a solution of 30 parts of methylated spirit ; 18 parts of ether, and 52 parts of solution of ammonia (3 parts of strong ammonia fortis in 100 of water). Pour half an ounce of this mixture in each cylinder and leave it overnight. In the morning all the carbon will have been dissolved and can be removed by brushing.

Carron Oil, Improved.—Carron oil is an excellent remedy for burns, freckles, sunburns, scalds, abrasions and lung affections. It is ordinarily made by adding linseed oil, and in absence thereof even sweet gingelly oil, to milk of lime. The milk cf lime is made by dissolving lime, made recently, in water to have the consistency of thick milk. It, however, oxidises rapidly and dries up prematurely. The following formula is free from these defects :—

Mix equal parts of milk of lime and linseed oil, and add one-fourth part of the whole mass liquid paraffin. Shake well before use.

Case-hardening of Iron.—Obtain a fireclay crucible big enough to contain the article to be case-hardened. Place some potassium cyanide in the crucible and then the article. Cover the crucible. Heat it strongly. Then plunge the article into water. This will case-harden the iron upto a depth of two or three inches.

Celluloid from Rags.—Millions of rupees have been made by enterprising Americans from this source. They have regular agents to collect tattered clothes and rags, shiploads of which have in normal times been sent to U. S. A. and there properly treated, and converted into celluloid for which we have been paying fancy prices. In India there are over forty million people strong from whom a properly constituted agency can collect rags. All rags in all conditions can be utilised.

Charcoal Dust.—On account of the acute famine of firewood in towns in India in recent times for which there could not be any justification, some enterprising people have actually collected charcoal dust and mixed with powdered cinders from engine-sheds and a little bit of cement. The mass in the form of a dough has been stamped like soap in machines to form what is known as *Laddu Koela*. Any help in sore straits is welcome. *See also " An Economical Fuel.'*

Chemical Snow, A New Fire-Extinguisher.—A new sort of fire-extinguisher, said to be effective and convenient, and based upon a new method of procedure, has lately been placed upon the market in Germany.

According to "*Reclams Universum*" (Berlin), the active substance employed as an extinguisher is carbon-dioxide, already familiar to us in extinguishers everywhere. But in this case liquid dioxide is forced into a steel container under high pressure and by means of a special device it is transformed before it makes its escape into carbon-dioxide snow. The latter has a temperature of 79 degrees C. below zero. The carbon-dioxide snow not only tends to stifle the fire, since its vapor, *i.e.*, the gas, will not support combustion, but in most instances it also cools off the surface of the burning substance to such an extent that the temperature falls below the point of ignition. Practical tests of this new method were made with highly inflammable substances as carbon-disulphide and gasoline, and these are said to have met with success. Another advantage of the use of caıbon-dioxide is that after the fire is extinguished the substance simply evaporates, leaving no residue to be got rid of.—*Literary Digest.*

Cloth Preservatives.—(1) Naphthalene balls. (2) Dry leaves of neem. (3) Deodorising tablets (q.v.). (4) Panari leaves. (5) Panari leaves mixed with neem leaves.

Colds, Easy cure for.—Boil 1 teaspoonful of flaxseeds, ½ chhtk. liquorice, 2 chhtks. rainsins in 1¼ seers of water on slow fire till reduced to one-half Then add 1 tablespoonful of lemon juice and 2 chhtks. of crystal sugar. Dose: 1 powa before retiring to bed. A tablespoonful may be taken when cough is troublesome. Tried in worst of colds. A great remedy for the lungs.

Colour, Magic.—*To produce milk from two waters*—silver nitrate + sodium chloride (common salt) = silver chloıide + sodium nitrate (shora).

(2) *To produce orange colour.*—Mercury chloride + pot. iodide = mercury iodide + pot. chloride.

(3) *To change green into blue.*—Pour water in syrup of myrobolans.

(4) *To change violet into green*—Methyl violet + hydrochloric acid.

(5) *To change violet into blue,*—Methyl violet + oxalic acid.

(6) *To produce red wine.*—Use pot. permangnate.

(7) *To change violet into green.*—Pot. permanganate + caustic soda. Colour deepens on the solution being boiled.

(8) *Writing with sulphuric acid or soap solution.* When dry the writing disappears; when wetted the soap solution writing reappears. Sulphuric acid writing becomes black on being heated.

(9) *Litmus solution.*—Changes colour with acidulated water.

Common Burns. Rub together 2 chhtks. of butter with 1 seer of white flour, a little salt, 2 chhtks. of sugar, 1 big spoonful of caraway seeds and a spoonful of ginger. Add 4 tablespoonfuls of yeast to some warm milk. Make a paste of all but by no means too stiff. Cover. Set before an oven to rise. Bake.

Crockery Cement (Transparent).—*Ingredients:* Place powdered white shellac, 16 oz., clean gum mastic, 2 oz., in sulphuric ether. Let stand for half an hour. Add 3 bottles of 90% alcohol. Shake again and again completely to dissolve it. When required heat the edges to be cemented. Apply cement by means of a pencil brush. Bind pieces firmly together till set.

Crucible-making.—To make small crucibles, let the fire clay be turned into a dough when it can be worked on a potter's wheel. Such crucibles can be made by means of cast iron or hard-wood moulds also, which consist of three sections.

Before being put to use, fireclay is incorporated with silica; coke broken and pulverised old crucibles of other infusible matter, properly reduced to a fine powder, tempered with water and kneaded for many weeks. While drying, if parts of broken crucibles have been used, the shrinkage is reduced to the minimum, and so there is all the less liability to crack. Kneading makes the clay more plastic. If a mould is used, the kneaded clay is placed in it and the core is hammered into it with a wooden mallet. The excess of the clay comes out and is scraped out; the core is taken out, and then the crucible by pressing the bottom section which acts as a plug, and is of the size of the bottom of the crucible. On the plug being taken out, a small mass

of clay is pressed into the hole left by the core, and the crucible is placed in a dry room for several weeks to dry. After this the crucible is placed in a cool part of the furnace and gradually moved until by degrees it has been heated to the highest possible heat available in the furnace. Then it is slowly taken out from the furnace for the purpose of annealing.

Cyclists' Capes, Waterproofing of.—Before waterproofing, let the cape be properly sewn. Pass through warm soap bath 1 lb. of soap, 1 gallon water. Immerse the cloth for half an hour. Take out, squeeze out, and pass through alum solution. Take out and again squeeze out surplus solution. Once or twice pass through clean water. Pass through a mangle. Dry in the open air, when it will become a little stiff, but quite waterproof.

Drakshasava is only a weak wine. Mix fermented juice of grapes, 6 parts; flowers of wood, fordia floribunda, 1 part; sugar, 4 parts. Cover well and bury underground in a cool place for a month. Take out. Filter. Bottle. If 5 to 10 grains of ferri carb. sagrada be mixed with every dose, which may be upto an ounce, you will get a blood tonic more effective than *port wine.*

Dry Cells.—1. The Burnley cell has a zinc cylinder lined with a plaster exciting mass made of sal ammoniac, 1 part; zinc chloride, 1 part, plaster of Paris, 3 parts, flour, 1 part; water, 2 parts. In the centre of the cell a carbon core is placed, the space between it and the exciting mass being filled with manganese peroxide, 2 parts; sal ammoniac, 1 part; zinc chloride, 1-10 part; powdered charcoal, $3\frac{1}{2}$ parts, water sufficient. The manganese oxide and charcoal play the part of depolarizing agent.

2. **Obach's Cell.**—(Patent C. 565 of 1893). Is formed of an outer cylinder of zinc, cemented to an insulating base composed of asphalt, 70 to 80 parts; paper pulp, 10 to 15 parts; resin, 10 to 16 parts. A smaller cylirder of depolarizing paste with the carbon rod in the centre is put inside the zinc cylinder, the space between the two cylinders being filled with exciting mixture. The composition of the depolarizing

paste is manganese peroxide, 50 to 60 parts; plumbago, 40 to 60 parts; tragacanth, 1 part. The exciting mixture is plaster of paris, 80 to 90 parts; flour, 10 to 20 parts. Make into a thin paste with a solution of sal ammoniac. The cells are covered with granular cork or any equivalent, to prevent escape of moisture, and a bitumen seal. One terminal is soldered to the zinc and the other to the carbon by means of an alloy of bismuth, 2 parts; lead, 2 parts; tin, 1 part; which expands on soldering, and insures good contact. The patents for Burnley and Obach cells are in force.

Eggs, To tell the age of.—The older the eggs, the less their density. Make a solution of salt, 1 : 20. One day old egg will fail to reach the bottom of this solution; three days old will almost swim; more than three days old will swim.

English Verdigris.—*Ingredients:* Blue vitriol, 12; white vitriol, 8; sugar of lead, 6; alum, 1. Powder the above coarsely. Incorporate by heat over fire.

Etcher's Wax, for making a wall round a plate to be etched, can be obtained by heating together in a pan over a water bath, yellow resin, 6; beeswax, 2. Incorporate by stirring. Add olive oil or sweet oil, 1 to 2. Mix intimately. Pour out on a stone slab to cool.

Faber's Pencils, Composition for.—*No.* 1. *Very Soft:* Aniline, 50%; graphite, 37·5%; kaolin, 12. 5%. *No.* 2. *Medium Soft:* Aniline, 14; graphite, 17; kaolin, *Hard:* Aniline, 3; graphite, 3; kaolin, 4. *No.* 4 *Very* 12. *Hard:* Aniline, 1; graphite $1\frac{1}{2}$; kaolin, 2. Generally speaking, more kaolin, greater the hardness. *Process:* Powder the ingredients; mix cautiously ; turn into a paste with water. Work the 'paste to make it perfectly homogeneous, pass through a sieve with suitable meshes of the size required for the lead pencil. Dry at ordinary temperature, fit with glue into wooden grooves in the semi-sticks and glue with upper sticks. A very good cottage industry for the hills where suitable deodar trees grow.

Fabrics, To Waterproof.—Soak the cloth in (1) in a solution of sal volatile and plaster of paris. Or in (2) solution made with Epsom salts, 9; borax, 12;

dissolved in warm water, 80. Or in (3) solution of sal volatile, 2 ; zinc sulphate, water 20. Or in (4) solution of alum , 6 ; borax, 2 ; sodium tungstate, 1 ; dextrine, 1. Dissolve in soap-lye.

Fire-bricks.—The fire-clays obtained from the mines are best crushed in an edge-runner mill, sifted and mixed with water in a pug-mill until the mass is turned into a paste suitable for moulding. Before doing so, kneaded clay should be left alone for about a month and then once more passed through the pug mill. This is necessary for souring or putrifying the moist clay so as to distribute water more intimately, the result being a more homogeneous paste. The clay thus obtained is slop moulded and the bricks are dried on hot floors and afterwards burnt in kilns.

Fish Bait.—The following is a good recipe for a fish bait : Oil of rhodium, 3 parts ; oil of cummin, 2 parts ; tincture of musk, 1 part. Mix. Put a drop or two on the bait, or rub trigger of trap with solution.

Flour, Selection of.—1. Good flour will be white with a slight yellowish or straw-coloured tint. That which is quite white with a bluish cast or with black specks should be rejected.

2. Moisten and knead the flour. Good flour will be dry and elastic ; poor one soft and sticky, especially so flour from spring wheat.

3. Throw a little flour against a perpendicular slate or any other smooth surface. Flour with life will stick to the slate in a mass. Bad one will fall down like dust.

4. Good flour pressed within the hand will retain the shape imparted by pressure. The staff of life must be judged by these standards.

Fuel, Economy in.—Most of the processes given in this book require heating and when an article is to be manufactured on a large scale, economy in fuel becomes a matter of utmost importance. In most parts of India, especially in the Punjab, both the charcoal and firewood are very expensive. The manufacturers to cut down their fuel bills should use soft coke. It does not give out volumes of smoke as lignite, bituminous or anthracite coal do. *See Coal, Varieties of*—(*Directory*,) *Part IV*. The

fire produced is very strong, and one charge lasts for a sufficient time. For this purpose a clay stove with big meshes or slits should be made inside a worn out or rejected canister having a large mouth. In the case of iron stoves, the coal or coke piled up radiates heat quickly and so cools down, thereby the temperature decreasing below the ignition point. The cavity in the stove for charging the coal should be sufficiently large and deep. To start the fire just place a few sticks or wood shavings in the cavity and fire it with a sheet of burning paper from beneath. Pile over the sticks or shavings some charcoal or a small quantity of the pieces of lignite or anthracite coal. As soon as the charcoal has been well lighted, pile the coke in big pieces. If coke be not available other varieties of coal can be turned into coke by burning them in the open clay stove described above. As soon as no more smoke comes out, those pieces should be removed to a pit and covered over with dust. This will quickly smother the live coal and change it into coke. Meanwhile fresh pieces of coal can be heaped and similarly treated.

While using the coke, ashes accumulate on the surface of the live coal and retard burning. To overcome this defect the fire should be raked from time to time with a poker. When the work is over big pieces of live coal can be quenched in cold water and agitated well to remove the adhering ashes. On being exposed to the air they dry quickly, being much less porous than charcoal and so can be used a second time just like coke.

Coal gives twice as many calories or units of heat as firewood or charcoal and at the present rate is much cheaper than either. Thus its use is calculated to lower the cost of production of all articles that require heating in their manufacture.

Gelatine Capsules are now in great demand for administering medicines with unpleasant taste. *Ingredients :* sugar, 5 ; gum-arabic, $2\frac{1}{2}$; water, 20. Take iron pins, with pearshaped lower ends, oil them slightly. Make the above solution lukewarm. Dip the pear heads into the solution. When gelatine films have been deposited, remove them and place them in wooden moulds of same size to dry. Generally two sizes of

capsules are made, one fitting over the other. By fixing the sharp end of the pins into a flat block, the operation can be accelerated. *An excellent job for cottage industry.*

German Silver.—*Common Variety :* Fuse together copper, 8; nickel, 2; zinc, 3½. *N.B.*—Reduction of quantity of nickel will make the product as bad as pale brass with liability of tarnishing readily. *Good Variety :*—Copper, 8; nickel 3; zinc 3. Fuse together. Product of a very beautiful appearance, only a little below standard silver. *Electrum Variety*: Fuse together copper, 8; nickel, 4; zinc, 3½. A popular variety, easy to work and of beautiful appearance with a shade of blue like very high polished silver. Liability to tarnish much less than silver.

Gilding Edges of Books.—Place the edge to be gilded in a horizontal position in a book-binder's press. make a composition of 4 parts of armenian bole and 1 of sugar-candy, ground well with water. Then mix with the white of an egg. Apply with a brush. When nearly dry, smoothen with a burnisher. Then slightly moisten the edge with a piece of sponge; all superfluous water to be squeezed. Gently place a piece of gold-leaf on soft leather. Pick it up with cotton wool and press against the edge of the book. On getting dry, burnish it over gently without injuring the surface with the point.

Ginger Beer, Imperial.—Place in a bottle cream of tartar, 1 lb.; powdered ginger, 2 oz.; crystal sugar, 7 lb.; essence of lemon, 1 dr.; water, 6 gallons; yeast, ½ pint. Tie the cork well and let it work.

Ginger Cakes.—*Ingredients*: Molasses, 2 pints; thick milk, one-fourth as much; butter, ¾ lb.; pearlash for two pies; sodium bicarbonate, 1 oz.; aniseed, 1 oz.; ginger, 1 teacupful. Thicken with flour. Incorporate well. Bake.

Glass pieces.—Why throw away glass pieces. Most of them being sorted can be remelted and can go to make new glassware. Glass factories should make it their business to collect these pieces from far and wide through regular agents. Glass pieces are stuck over walls to prevent trespassers and thieves taking liberty to

encroach upon your homes which to you must be as good as castles. Glass pieces being powdered are used for kite-strings to give them sharp cutting quality. Glass pieces go to make sandpapers (q.v.) In Calcutta, Amritsar and elsewhere glass pieces are being remelted to make new glassware.

Green Writing Ink.—(1) Powder 1 oz. of verdigris and dissolve in 2 pints of vinegar. Let stand two or three days. Strain the liquid. (2) Dissolve crystals of verdigris in enough water for the process. *To use*: Dissolve either of the solution in 1 pint of water; add gum arabic, 5 dr.; white sugar, 2 dr. Ready for use.

Gun Cotton.—To prepare it in small quantities, mix pure dry nitrate of potash with 30 fl. dr. of sulphuric acid (sp. gr. 1·845). Let the heat so produced as a result of the chemical action cool down. Then gently and slowly stir in finest carded cotton into the mixture. When cotton is completely saturated, which it will do in about a minute, throw the cotton into a tub of river or clean water. Again and again change water till there is no more of acidity as tested by blue litmus paper. Squeeze the lot in a piece of cloth. Pull it out. Dry it at a temperature not above 140° F. *N.B.*—Gun cotton is an explosive and greatest care should be exercised in handling it.

Hair Falling off, To prevent.—Mix well by shaking and dissolve ½ pint brandy, 1 tablespoonful of superfine salt, 1 teaspoonful of fine powder of alum. Filter. Apply. If used daily, dilute with soft water.

Hair Restorer.—Lac sulphur, 1; sugar of lead acetate, 4; rose water, distilled water or rain water, 32. Mix. Shake well before use. Apply to the scalp twice a day for a week. The preparation does not dye the hair; rather it restores the natural colour.

Harter's Iron Tonic.—*Ingredients*: 2 parts each of calisya bark, gentian, citrate of iron, cardamom seed, simple syrup enough, and 8 of water. Mix well.

Home-made Filter.—Get a cask or wine barrel. Get a frame of hard wood made to fit the barrel circumference-wise. Cover the frame with coarse wire cloth and then over the former with fine brass wire. Fit this frame over supports into the barrel. Load the

frame lightly up to a depth of three inches with fine gravel; then three inches deep with sand; then two inches deep with small pieces of charcoal without allowing any dust to get in, and then once more with two inches of sand. Water poured gently over the uppermost layer will trickle down into the lowest empty part of the barrel. The hamams used for heating water can very easily be improvised as filters in summer. Let the centre charcoal funnel be closed at the bottom and ice placed thereon, in its turn also closed, and cold and filtered water can be had readily.

Honey, Preservation of.—Crude honey keeps well for a long time as it contains formic acid. To prevent fermentation in pure honey, mix 2 dr. of formic acid to every 2 lb. of honey taken.

Horse Powder.—Mix thoroughly powder of fengureek seeds, flowers of sulphur, antimony powder, cream of tartar equal quantities. *Dose:* One tablespoonful three times a week, mixed with their fodder. In case the horse be feeling out of sorts, give the powder daily.

Indelible Pencils.—Make an impalpable powder of silver nitrate. Add lampblack enough to give it a black colour, and gum-arabic enough dissolved in hot water to make the powder sticky. Rub together the constituents. Turn them into sticks to dry.

Iodine as a water-purifier.—Don't feel that you have to get typhoid fever because you may have to drink from a polluted stream. The army medical school has perfected a rapid and easy way of purifying drinking water while you wait. Hold your quart thermos bottle in one hand and fill it with water. Add one drop—two will do no damage—of tincture of iodine, the ordinary 7 per cent. Shake the water up a bit. In twenty or thirty minutes all the harmful bacteria that are likely to be there will be killed. The amount of iodine added is too slight to even taste. Bacteriologists used to think that all the bacteria in water had to be killed before it would be fit to drink or potable. It has, however, been found that it is seldom that any harmful bacteria will be present that cannot be rather easily destroyed. The greatest danger in drinking water of unknown purity is from diseases of

the typhoid fever and cholera group, that are caused by non-pore-forming organisms and can be easily killed as compared to many entirely harmless bacteria. It is for this reason that the simple Iodine treatment is so effective. *Science Service's Daily Science News Bulletin.*

Any enterprising young man can very well exploit the above secret. Scheme on correspondence with the Editor, care of the publishers of this volume.

Iron Water.—Cover one seer of new iron nails with 6 chhtks. of fresh water. Let stand for 8 or 9 days, then add 1 seer of more water. As the water is being used, go on adding more to make up the loss. If this water be taken with meals with a little claret, it is very useful for increasing the red blood cells and in bringing red colour to the cheeks. If ever this water should constipate the bowels as all iron compounds tend to do, give some confection of roses or of senna.

Labels that will not peel off.—Labels are sometimes very tiresome things. We have all found that when stuck to shiny book covers, or to the bottles in our chemical sets, these small rectangles of paper have an unpleasant habit of dropping off. Of course it becomes very annoying if two labels slip off, say, two bottles at the same time, because we may not be able to decide which bottle contains which substance.

If you want to make labels stick like grim death, take a little starch and equal amount of gum-arabic, three times as much granulated sugar, and a little water. Heat slowly over the fire until all is mixed to form a syrupy fluid, and then bottle and cork up tightly. This will give you an adhesive that will never allow the labels to come unstuck.

Laundry Blue.—Mix together artificial ultramarine blue with glycerine. Slowly add water until a fairly coherent powder, and not a paste, has been obtained. Put into moulds and subject to great pressure in an office press. To get a liquid soluble blue, all you have to do is to dissolve in distilled or rain water some potassium ferri-forrocyanite. (*See Directory.*)

Lead Shot, Manufacture of.—For the preparation of lead shot, one must construct a special tower

like flue. At the bottom of the tower there should be provided a cistern of cold water with openings for inlet of fresh cold water and outlet of the heated water. At the top of the tower there should rest a colander—a sieve-like apparatus having holes, big or small, according to the size of the shot required, but the holes being separated from each other three times the diameter of the shot, otherwise the descending drops are liable to run together and shall have to be remelted. The colander can be made of clay or of sheet iron, coated with litharage to prevent the lead running too rapidly through the holes. The molten lead is poured into the colander. So that the shot should have spherical shape, a layer of oil should be spread over the cold water.

Lemonade, Real.—Remove yellow rind from a dozen number of fresh and bright lemons. Be careful that you remove only the yellow zest containing the essential oil. Cut it into slices and place it in an earthen vessel, a glazed one preferred. Cover with boiling water and then with a lid. Let digest. From the inside pulp of the lemons taken above, and from one dozen more, press out juice. Strain in a glazed vessel. Add one seer of sugar and 7½ seers of water and the infusion from the peels. Incorporate by stirring. Taste some sample, adding more of juice or of sugar. Let the lemonade be not too watery. To make it rich you require a sufficiency of fruit juice and of sugar.

Lemon Water.—Do not throw away the rinds of lemons. Take rinds of 16 large lemons and about 3 tolas of table salt. Cover well with water in a retort. Heat. Distil only half of the water put in. Excellent for the liver.

Life Tincture.—Good whisky, 320; aloes, 9; bruised zedory root, 1; bruised agaric, 1; saffron, 1; bruised nutmeg, 1; rhubarb, 2. Distil in the sun for a few days. *Dose*: For grown-ups upto 60 mm. or 1 teaspoonful.

Lime Juice.—1. Lime fruit syrup, ½ oz.; lemon syrup, ½ oz; solution of acid phosphate, 1 dr.; shaved ice, 2 oz. Mix with soda. Stir thoroughly with coarse stream : and stir again.

2. Pure lemon syrup, 1 oz.; lime juice, ½ oz. Pour over fine ice in mineral glass; fill up with soda and stir.

3. Into a 13-oz. glass, tall and slender, draw 1½ oz. of grape juice; squeeze the juice of 1 lime and add three dashes of angostura bitters, 2 dashes of phosphate and 1½ oz. of simple syrup. Fill the glass one-third full of fine ice and balance with carbonated water. Mix and decorate.

Lime Juice Cordial.—Boric acid, ¼ oz.; citric acid, 2 oz.; sugar, 3 lb.; water, 2 pt. Dissolve by heat and when cold, add lime juice 30 oz.; tincture of lemon, 2 oz., water, 1 gal. Mix and colour with caramel.

Listerine.—The following formulas give preparations said to resemble Listerine, the true formula being kept secret by the manufacturers.

1. Boric acid, 128 gr.; thymol, 16 gr.; menthol. 16 gr.; oil of eucalyptus, 4 drops; oil of wintergreen, 4 drops; oil of horsemint, 4 drops; water, 12 oz.; alcohol, 4 oz.; caramel, 1 to 2 drops. Dissolve the boric acid in the water and the ingredients in the alcohol, and mix the solution. Let stand for a day or two, with frequent shaking, and filter. As an improvement on this formula, it has been suggested that only half the quantity of the menthol and oil of horsemint be used. In the proportions prescribed they dominate the solution so far as odour and taste are concerned.

2. Acid benzoic, 2 dr.; borax, 2 dr.; boric acid, 4 dr.; thymol, ¾ dr.; eucalyptol, 10 drops; oil of peppermint, 6 drops; oil of thyme, 2 drops; rectified spirits, 5¾ oz.; water enough to make 31 fl. oz. This still lacks baptisia. It is claimed by the makers that this is one of the ingredients used.

3. Oil of eucalyptus, 10 gr.; oil of wintergreen, 10 gr.; menthol, 10 gr.; thymol, 10 gr.; boric acid, ½ oz.; alcohol 4½ fl. oz.; water, sufficient to make 16 fl. oz.

4. Benzoic acid, 64 gr.; boracic acid, 128 gr.; thymol, 30 gr.; menthol, 30 gr.; borax, 64 gr.; oil of eucalyptus, 4 drops; oil of wintergreen, 4 drops; oil of horsemint, 5 drops; alcohol, 4 oz.; water, enough to make 1 pt.

Silica Soap.—Mix well 200 gr. of fine sand and 600 gr. of fine carbonate of potassa; fuse in a crucible capable of holding 4 times as much. Carbonic acid escapes, the silica and potassa combine and form glass; pour out the glass commonly termed silicated potassa on an iron plate. The compound, formed in this manner is pure silica soap.

• **Liver Complaint, Simple Cure for.**—Continue to take for some days every morning and evening 1 table-spoonful of powdered charcoal with fresh milk.

Lockjaw, Mortification Powder for.—*Ingredients*: 4 chhtks; gum powder; equal quantity sulphur; half as much alum; 1 chhtk. charcoal. Powder well the last three and mix carefully with the first one. *Dose for a strong constitution*:—As much as can be placed on a silver four anna piece in a small teaspoonful of strong vinegar. *N.B.*—Charcoal is indicated to dry up the wounds.

Mahogany Varnish.—Crush to a fine powder orange shellac, 4 oz.; resin, 1 oz.; gum sandrac, 20 oz.; in 1 pint of methylated spirit. Dissolve by frequent stirring. Cautiously strain into another bottle. In another dissolve one-anna of bismarck brown in a quarter pint of spirit. A few drops added to the varnish will give a mahogany stain. Mahogany colour is reddish brown, much the same as of cut sheesham wood (blackish red variety) in India.

Nutrition from Canned Fruit.—Science has carried the preservation of food to such a point that given adequate stocks and storage accommodation, Britain could live for months, may for years, without any deterioration in health, entirely on preserved foods, wrote a special correspondent in the *Sunday Times*.

Proof of this claim was provided by a remarkable experiment carried out by Mr. W. J. Godden of the Rowett Research Institute at Aberdeen.

TESTS ON RATS

Mr. Godden told his fellow nutrition experts how he had fed four generations of rats solely on food canned in Britain including beef, brisket, tongue, herrings,

cabbage, beetroot, carrots, apples and other fruit, bread, milk and syrup. At the same time another group of rats was fed on similar foods bought or grown locally and cooked as the housewife cooked them.

Throughout the experiment careful report was made of the weight, mortality and breeding data of both groups, while periodically numbers of the rats were killed, and analysis made of the physiological condition and chemical content of the carcases.

The experiment in which, incidentally, about 850 rats consumed $3\frac{1}{2}$ tons of canned foods and 800 pints of evaporated milk—revealed no significant difference in health and physique between those on the preserved and those on the fresh diet.

"It appears therefore," Mr. Godden concluded, "that canned foods form a useful and reliable adjunct to the human dietary, and might be used with perfect confidence from the nutritional point of view."

MANY METHODS

Canning is not, of course, the only method of food preservation. Freezing, drying, and storage in carbon dioxide are also widely and satisfactorily used. By means of one or more of these methods it is now possible to preserve meat, wheat, especially Canadian-flour, and some vegetables, for as long as ten years; milk, some fats, fruit, vegetables, eggs, and even certain species of fish, for two years and more, and other types of fish, chilled and frozen meat and green vegetables for several months.

While the value of these storage methods to enable Britain to withstand blockade and transport dislocation in war was obvious, their importance is little less in time of peace. It is now possible to put fresh foods of all kinds into storage in time of glut, for use in times of shortage.

We can be independent of seasons and harvests, having fresh foods of every kind all the year round, at stable prices. All that is necessary is to put the discoveries of scientists to full use, by setting up adequate storage plants all over the country.

Orange Cordial.—Rectified whiskey, 5 gal; fresh lemon peel, 1 powa; dried orange peel, 1 seer,

fresh orange peel, $1\frac{1}{2}$ sr. After adding together, let stand for about a fortnight. Take out and mix 3 gal. of soft water, $1\frac{1}{2}$ gal syrup.

Paper Matrices.—When more than one block for printing is required or of a form composed in any type is required an impression is taken in type metal. This is called stereo type plate. For this purpose make a jelly paste of white flour (maida), starch and whiting or best chalk. Wet a sheet of blotting paper, cover either of its surfaces with the above paste; lay over it a tissue paper (Sialkot-made paper is tissue paper. Another kind of tissue paper is made in the jails). Lay alternate layers of paste and tissue paper, till five or six sheets have been laid on. Dust the block or type of which the impression is to be taken with whiting and over it lay the combined sheet made of tissue paper touching the type. Let dry. If placed on steam heated table, the process of drying will be accelerated. During this time cover the matter with a blanket. As the matter is perfectly dry, put it in a matrix and pour over it type metal. The plate so formed is mounted on wooden blocks. As many plates can be made in this way as the number of combined sheets prepared.

Paper Slates for Students.—Obtain slate dust from the quarries, reduce it to a fine powder by means of a disintegrator, and rub it with water upon a stone. When quite dry, rub it again with a muller, add 1 part of lampblack to every part of slate powder taken. Mix well with glue size and gently boil it at a moderate temperature. Apply thin coatings of the composition on cardboards or thick tissue papers. Allow them to dry. Repeat the operations at intervals so as to obtain the desired thickness, when rub the surfaces with pumice and last of all apply an infusion of gall nuts.

Paper, To make Water proof.—(1) Paper may be made semi-transparent and durable with the following solution: Heat over fire, pale amber resin, 50; paraffin wax, 45; silicate of soda, 6. Dip paper in the above solution while hot. The paper will stand very wet weather and will be found very useful for packing butter, razor blades, and all dry powders containing hygroscopic substances like common salt. (2) Another way of waterproofing paper is to lay a whole quire

opened and flat on the table and to iron it hot quickly, first placing on the table wax or paraffin. The melted wax will spread and get into the pores. Surplus wax will be absorbed by the sheets just underneath.

Paste for Bill-posting.—The usual method is to make a paste with white flour (*maida* with 2 per cent. of powdered alum). Ordinary pastes thus made cannot resist the action of wet weather. To overcome this defect, after sticking the posters, a wash of soapwater or of sugar of lead solution or of crude lac (lakhdana) in naphtha is given.

Pepsin.—Pure pepsin, 260 gr.; distilled water 3, oz.; glycerine, 3oz.; alcohol, $1\frac{1}{2}$ oz.; purified talcum, 2 oz.; lime juice enough to make a pt. Dissolve the pepsin in the water. Mix well 8 fl. oz. of lime juice, add glycerine and alcohol and then remainder of the lime juice. Incorporate the talcum and set aside for several days, agitating occasionally, and then filter enough lime juice to make one pt. of finished product. To make a syrup of this add enough of simple syrup to make 3 qts. and mix thoroughly.

Pictures, Duplication of.—Immerse the leaf or picture in a solution of potash; then in a solution of tartaric acid. This will diffuse the tartrate of potash throughout the unprinted portions and so such portion will not allow the oil to act upon the unprinted portions. Pass the ink-roller on the paper or picture laid on a perfectly smooth and flat stone or better still on a glass slab. Place the paper to be printed over the print and pass a clean rubber roller over the picture. You will with practice get a very nice duplicate.

Phonograph Records, Composition of.—Melt together carnauba wax (*see Directory*), 36; beeswax, 12; sodium stearate, 25; aluminium oleate, 27. Mix intimately by stirring. Next add a little gas black. Put into moulds.

Piles Cure.—Make a paste of 1 chhtk. of confection of senna, $\frac{1}{2}$. chhtk. of cream of tartar, $\frac{1}{2}$ of sulphur, and enough of ginger syrup. Mix intimately. Take as big a piece as of chickory nut once or twice daily to keep the bowels active.

Piles, Ointment for.—Lard, 32; camphor, 2; powder of galls, 8; laudanum 4. *Use*: Apply every night before going to bed.

Protective Coating for Stone.—A protective coating for stone surface, particularly adapted for use where stone walls are subjected to the corroding effects of chemicals or to mechanical abrasion, has been developed from certain silicic acid esters. Tetraethy silicate ester dissolved in alcohol, to which has been added the desired pigment, may serve for this purpose. As the coating is applied, the silicic acid is set free, and a rapidly drying insoluble film results which is easy to clean and which possesses great resistance to chemical attack and to mechanical wear. By use of proper pigment it may be made to resist temperatures up to 1200° C. *A.E.B.*

Puddings.—*Preliminary Remarks*. Puddings are made in a variety of ways, one book giving as many as 85 kinds, so it is difficult to include all kinds of pudding in so small a space at our disposal. Only a few prominent ones are given hereunder :

Puddings are either boiled or baked. The former are generally tied up in a cloth, which if not kept scrupulously clean is apt to make the outside of the cake rather disagreeable. So directly after a cake of this type has been made, the cloth should be put into boiling water and the cloth washed with country soap or with washing soda in the ordinary way. In making bread pudding, the cloth should be tied loosely; if of latter, tightly over the basin. When the pudding is put in, the water should be boiled quickly and well stirred to mix the ingredients thoroughly. Better, pudding must be strained through a coarse cloth when everything has been mixed. If eggs are used, they should be strained separately, the yolk and white being beaten separately. Very good puddings can be made without using eggs, but only a small quantity of milk should be used, and such puddings should be boiled for two or three hours. In place of eggs, a few spoonfuls of any kind of bottled malt liquor, or one of yeast will be equally good. In places where snow falls snow may be taken. So that pudding may not be wasted by sticking, the pans and basins should be properly greased.

1. **Apple Pudding.**—Mix together 6 chhtks. of butter and half a seer of white flour or sooji. Make a paste with lukewarm water. Work it thoroughly, noting it out two or three times. Line the basin with this paste. Fill with big pieces of pared, quartered and cored apples, with two tablespoonfuls of loaf sugar. Cover with the paste. Boil for one to two hours according to size of pudding and ripeness of apples.

2. **Fresh Fruit Pudding.**—Proceed as No. 1.

3. **Rice and Fruit Baked Pudding.**—Clean off dirt and wash sufficient quantity of rice. Add a little water and set it in an oven till the water has been absorbed. Add some milk. Work it well with a spoon. Place it in the oven again. Go on working it from time to time till it gets quite soft. In the last operation a little cream may be added. Fill a dish almost full with fruit. Sweeten the fruit, lay on the paste unevenly with spoon. Bake to make the apple of a light brown colour.

4. **Sago Pudding.**—Take about one-third of a teacupful of sago. Steep in about 7 chhtks. of water. Make a jelly. Sweeten. Put in a dish. Add pared plums, sliced apples or any other fruit. Bake it. 1 chhtk. sugar, 2½ chhtks. of water will make a good pudding.

5. **Hasty Pudding.**—Boil half a seer of milk and while doing so, mix by stirring about a tablespoonful of white flour (*maida*). Serve with cold butter and sugar or with treacle.

Rat Poison.—(1) Let 2 parts of barium carbonate be mixed with 1 of lard and pellicles placed in the way of the rats. Barium carbonate is tasteless, smell-less, impalpable, and produces great thirst. All vessels of water should, therefore, be covered. (2) Mix 1 part of plaster of paris with 2 of oatmeal. Make small balls and place them about the haunts of mice and rats.

Rubber Stamp Pad.—Consists of an outer tinbox in which is placed a smooth wooden board to match. This is covered over with felt (*banat*) which is saturated with the composition that follows: gelatine, 1; water, 6; glycerine, 6; colouring matter, 6. *Black colouring matter*, gelatine glue, 1; lampblack, 3; aniline black, sufficient; glycerine, 10; venetian soap, 1; salicylic acid, $\frac{1}{8}$

Red, Blue or *Violet*: gelatine glue, 1; aniline of the required colour, 2; absolute alcohol, 1; glycerine, 10; venetian soap, 10; salicylic acid, $\frac{1}{5}$ *Process:* Swell the gelatine with cold water. Boil. Add glycerine and colours.

Rubber Stamps and How to Make Them.—For a long time the art of making rubber-stamps was scrupulously kept as a guarded secret, but it is not so difficult as it may appear. Only a little practice and some experience in the art is sufficient to set you up as a Stamp-manufacturer

The process divides itself into (1) setting up and locking the type, with or without any floral decoration into a wooden or iron chase; (2) preparing the clay matrix and subjecting it to pressure to receive the impression of the type which is positive, *i.e.*, reads as ordinary print; (3) transference of this impression on to the rubber sheet by means of heat in a press; and (4) mounting the piece of the rubber sheet on a wooden or metallic handle.

The beginner should provide himself with a chase made of hard wood as of ebony, or mahogany or teak. As the type is not to be subjected to very great pressure, a well-made wooden chase can answer the purpose. A cast iron chase will equally do. Any ironsmith can prepare it from strong iron flat bars. It is advisable that one should have two or three chases. When the type has been set up in a composing stick, it is placed on a flat and perfectly level slab of stone, or wood or iron and the chase, a rectangular framework placed round it. Pieces of wood, generally tapering, are then placed round the type, and the wedge shaped pieces of wood driven into one another so as to lock up the type firmly and securely. If now the chase be lifted on one side gently, none of the type should move out of place. Next two three sheets of paper are placed on the type, and over them a flat wooden board. The board is then beaten with a mallet. This imparts evenness to the type that has been set up. The type is now ready to receive the impression of the mould.

The mold is made of a putty, harder than the ordinary putty used by the glaziers, which may be made by (1) taking two parts of plaster of paris and one of

French clay or soapstone, and mixing them with water just enough to form a thick putty; or (2) taking fine powder of soapstone, 19 oz., best plaster of Paris, 16 oz.; fine powder of china clay or kaolin, 16 oz. The materials should be mixed dry to have a homogeneous composition, and sifted through a sieve with fine meshes. Composition No. 2 should be taken as much as is required for a single operation, and mixed with a solution made by dissolving 5 oz. of dextrine in 2 pints of hot water. This must be used on cooling. The putty should be made in the shortest possible time, and kneaded well. It should be free from lumps. It should be spread over the matrix, which consists of a plate thick enough to stand the pressure of the press and having on both sides longitudinal ribs one-eighth inch high and quite parallel to each other. The under surface of this matrix ought to be planned to ensure even surface to the rubber plate. Within the longitudinal ribs the composition made above is filled up, and the surface of the composition quickly levelled with a flat iron bar, a table knife or spatula, and made level with the longitudinal ribs. This being over the type is moistened with benzine or to have a cheaper solution with two parts of turpentine and one part of benzine. The matrix plate is then placed against the type and made to rest on the four springs placed at the corners of the chase. Both the type plate and the matrix are then placed under an iron press (an iron *shikanjah*) having perfectly level surfaces and being completely parallel to each other. The matrix plate is then subjected to gentle pressure so as the composition plate between the longitudinal ribs may have an impression of the type. The pressure is then released and the matrix plate, not the composition, removed, and allowed to stand for three minutes. The matrix plate is once more placed on the composition form and subjected to a little greater pressure than before. A little practice will show how much pressure is sufficient.

The press for this purpose can be bought from any junk shop and should be strong enough to stand a heat of 250°F. without warping.

The matrix with the composition being removed from the chase the impressions should be clear cut. Any defect

in the impressions will be faithfully reflected in the rubber plate which is made with it. Small holes are then made in the matrix composition but not too near the impressions, so as to allow the moisture to escape. The mold is then heated in an oven. Too much heat or carelessness in mixing the composition is liable to crack the plate. After an hour and a half the plate is removed from the oven ; its surface is smoothed with sandpaper of fine grain, and the dust blown off with a pair of bellows.

Next a rubber plate unvulcanised and specially made by the rubber manufacturers for this purpose is placed against the matrix, the surface of the matrix being dusted with fine powder of soapstone to prevent adhesion of the plate with the sheet of rubber. And the matrix plate together with a rubber sheet, and over that a sheet of tin iron, are subjected to pressure just enough to ensure clear impression. The press is then heated over a stove to a temperature of 220. In about three to five minutes the rubber is vulcanised. In case the weather be cold, it may require ten minutes. If the press be overheated, the rubber will be burnt. The vulcanised rubber will have a bluish tint, and if pricked with a needle will have no mark as the needle is pulled out. When vulcanisation is over, the plate should be removed by an even pull, and brushed over with powdered soapstone at once. If a number of stamps have been included in the sheet, pieces are cut out, and trimmed with a pair of scissors, and mounted on the handle with rubber solution or with shellac varnish, which can be made by dissolving shellac in spirit or naphtha, the latter being highly inflammable, to the consistency of liquid glue.

The Rubber Stamp Ink is given in the chapter on Office Appliances.

Safety Papers.—Paper like bank cheques may be prepared by passing sheets through a solution made with 0.015 gr. of gallic acid in 4 oz. of distilled water.

Salt, Uses of.—(1). In many disorders of the digestive system, a teaspoonful of salt works wonders. In *Colic*, take one teaspoonful of salt in a tumbler of water before going to bed.

(2) Use as above for a man stunned with a heavy fall.

(3) In apoplexy, if a man be incapable of swallowing, pour down his throat salt and water. If not, sponge his head with cold water containing some salt. Then administer salt water. The patient will soon shake off his lethargy.

(4) In a fit, place the feet of the patient in salt water with mustard powder. Rub the legs briskly. Remove all bandages from the neck. Place him in a cool apartment.

(5) In many cases of severe bleeding from the lungs when other remedies fail, two teaspoonfuls of salt given with water may work wonders.

(6) If a person be bitten by a mad dog, wash the wound with brine for an hour. Then bind a piece of rag saturated with salt water.

(7) If a man be suffering from toothache, apply with a piece of rag warm brine to the offending tooth. Repeat twice or thrice. Likely to afford relief in most cases.

(8) When gums are swollen, rinse the mouth several times with warm brine, containing some alum. Press the gums with the fore-finger towards the points of the teeth well enough. Repeat several times.

(9) Brine is best to wash the teeth with when they are covered with tartar.

(10) If neck is swollen, wash the affected part with brine. Also sip it twice a day until relief.

(11). To expel worms, use salt in a moderate degree with food.

Scouring Bricks.—Scouring bricks, (called jhawan is Panjabi), are excellent as abrasive for the feet and can be made of different forms to serve different purposes. All that is required is to mix sand with a small percentage of clay and after the mass has been kneaded with a small proportion of water to get them baked in a kiln. Householders can bake them in ovens or hearths. The necessity of baking may be avcided by adding a little cement to the mixture. An excellent cottage industry for the districts of Hissar, Gurgaon, Multan and for Sind.

Shaving Soap.—Cut up finely to dissolve readily 2 lb. of best white bar soap and ½ lb. of common bar soap. Put into a copper kettle containing about 2 pints of soft water. Let stand on fire. Dissolve by boiling and add a pint of alcohol or industrial spirit, ½ gill, spirit of turpentine. Boil together for 5 minutes. Stir well. While cooling, add the desired perfume. Cheap and efficient.

Shaving Powder.—Powdered soap; 1 lb.; sodium carbonate dried, 2 oz.; wheat starch, 3 oz.; orris root, 1 oz.; oil of bergamot, 1 dr. Mix well.

Silvering (Cold) of *copper*.—Rub well on a clean surface of copper or brass plate with a piece of soft leather or a big broad cork moistened with water and dipped into a powder consisting of silver chloride, 1; pearlash, 3; common salt, 1½ (or alternately) precipitate of silver powder, 1; cream of tartar, 2; common salt, (2). When the metal has been well silvered wash it in slightly alkalized hot water. Wipe clean. Water can be alkalized by adding a little sodium carbonate or caustic soda.

Silver Plating Fluid.—Let ½ oz. of nitrate of silver be dissolved in 6 of soft water; thereafter dissolve in the same solution 1 oz. of cynaret of potash. Mix intimately by shaking. Let stand to clarify. Meanwhile keep ready half ounce phials, half full of Paris white or fine whiting. Fill them with the liquid. The whiting keeps the articles clean and makes silvering better.

Silver Solution for Plating Copper, Brass, and German Silver.—Place ½ tola of good silver in a glazed earthen vessel or china dish. Add 1¼ tola of nitric acid. Place the dish uncovered in warm water in a separate place for the silver to dissolve completely. Avoid nitrous fumes. Add ½ gill of water and 1 teaspoonful of refined salt as Victor Salt of Lahore. Let settle. Drain off and repeat till there is no more of acid taste as can easily be tested by means of a blue litmus paper which will not turn red if no acid be present. Last of all add 1 pint of water to the precipitate and a scruple of cyanide of potash. To silver-plate, place in a China cup or saucer or some glazed vessel a piece of zinc plate, 2″ long, 1″ wide, and 1.8″ thick. Clean the

article to be plated. Place solution over the zinc. Immerse the article in the solution and let it rest on the zinc for half a minute. Wipe off with a piece of dry and clean cloth. Repeat the process once more. Polish with deer skin or some other like cloth.

Skeletons, Preparation and Bleaching of.—The oily matter of the bones can be removed with patience. Place the skeleton in a tin box. Solder the covering leaving only one small hole for benzine to be poured in. As soon as the inside of the box has been filled, stop the hole and keep it aside for three months. Now if you take out the skeleton, you will find it perfectly clean. Put the skeleton in the sun and let Nature do her work. No need of chlorine or any other bleach. Haste will make waste.

Sugar of Lead.—For the preparation of Sugar of Lead or Lead Acetate, procure two copper boilers, made electro-negative by a large flat piece of lead soldered inside each of them. Now place 22 parts of acetic acid (Sp. Gr. 1. 0843) in the boiler, and heat the boiler. Sprinkle little by little 13 parts of fine powder of litharge, stir constantly and continue heating, until the acid has been thoroughly saturated. This can be tested by dipping a glass rod in the mixture. On the rod being exposed to air a thin film of lead acetate will be at once deposited. At this stage, mother liquid from any previous process may be added, and the whole heated to 100°C. Let cool and settle. Pour off the supernatant clear solution into another similar copper boiler, and heat till the liquor attains the specific gravity of 1.266 to 1.267. Run into glazed stoneware, with inside smeared with candle-grease. On standing, crystals will be deposited. A little excess of the acid is recommended during boiling and crystallisation to obviate the formation of any basic acetate which hinders the process of crystallisation. The product is about 38 parts of sugar of lead.

Sugar of Milk.—To get this product for which there is a great demand by the Homeopaths, all that is necessary is to evaporate clarified whey till it crystallizes and to purify the crystals by digestion with animal charcoal. Only repeated crystallisation can give good result.

SULPHUR CANDLES

Sulphur Candles for disinfection.—Get a mould made of *sheesham* or acacia wood 4″ in diam. and 2″ deep in the centre slightly tapering towards the bottom just like the tips of paraffin candles. Suspend four pieces of loose lamp wicks over the moulds at equal distances and let them reach half way down into the hollow wooden tubes. Now melt sulphur in earthen crucibles over fire and pour the liquid stadily into the moulds. When cold, pull out the candles by means of the wicks. Cut them half inch above the candles. Dip the wicks into melted paraffin so as to help wicks catch fire when required.

N.B.—Never melt sulphur in an iron pan, otherwise it will become brittle.

Tablet Making Machine.—Compressed tablets of medicines and of other substances like ink have now come much into vogue. The tablets have several advantages over the powders, in as much as the tablets are easy to take, and being almost of same weight uniformity is kept. The retail dealers also find it advantageous to sell the articles without weighing. For making the tablets, machines of different makes, but essentially same in construction are used. Their shapes may be cylindrical, oval, octagonal, or square, the lower and upper surfaces being convex, flat or of any other form according to the shape that is desired to be given to the tablets. They can make tablets of different sizes according to the size of the dies : $\frac{1}{8}$ to $\frac{3}{4}$ in diameter.

In making the tablets the powders should be as fine as possible and should be thoroughly mixed. They should be granulated, *i.e.*, changed into a uniformly coarse powder before feeding into the machine. This is done by wetting the mixture with suitable liquids, like alcohol or water. This slightly damp mass is then forced through a sieve to form the granules, which being dried are again sifted. The medicines are mixed with certain excipients, which are classified into (1) Moistening agents, *e.g.*, water and alcohol ; (2) Adhesives, *e.g.*, cane sugar or its syrup, acacia, glucose, gelatine, isinglass ; (3) Bases, *i e.*, substances that form the vehicle of the medicines, *e.g.*, cane sugar, lactose or milk sugar, salt, dextrine, etc., (4) Disintegrator, *e.g.*,

starch ; and (5) absorbents *e.g.*, milk sugar and magnesium carbonate.

Different articles are manipulated in different ways. In manufacturing the tablets, especially those containing medicine, scrupulous care must be exercised in weighing the ingredients and in triturating them, and more so in cleanliness, for the slightest carelessness may result in serious results. The mixed substances should be free from moisture, and the dies and punches should be from time to time cleaned and oiled.

As most of the granulations are liable to adhere to the surfaces of the die and the punches, they should be lubricated with white oil (odourless petroleum), refined talcum powder, or fine powder of boric acid.

In every tablet-making machine, whatever its shape may be, there is a hopper or funnel, into which the medicated or unmedicated mass is placed ; the feeding shoe that automatically fills the die and removes the die in position ; a lower plunger that holds and works the lower punch and regulates the weight of the tablets ; an upper plunger for holding and working the upper punch and imparting compactness and hardness to the tablets.

All bearings of the machine ought to be well oiled and kept perfectly clean, and when the machine is not in use all parts should be rubbed over with vaseline.

Tin-foil Paper.—Greatly in demand for packing cigarettes, tea, coffee and various foodstuffs. To obtain them coat cheap paper with a solution of gum and *fine powder of tin* which can be made either by (1) melting tin at a low temperature and shaking it again and again while the temperature goes down. A part of tin is thus left in a fine powder and can be separated by agitating it with water. (2) Dissolving granulated tin in strong hydrochloric acid. Then dilute it with water and place a stick of zinc into the solution. Fine powder of tin will be precipitated.

After the powder has been well dried it is applied as indicated in the first paragraph, the desired brilliancy being obtained by suitable calendering.

Tonic Syrup for Children.—*Ingredients :* Calcium hypophosphite, 35 grms ; potassium hypophosphite, 17.5 ; sodium hypophosphite, 17.5 ; ferric hypophosphite, 2.25 ; quinine bisulphate 1.1 ; sodium

citrate, 3.75; Hypophosphorous acid (30%) 5 c.c.; sugar, 300 grams.; glycerine, 50 c.c.; water to make 100 grms. *Process.* Let ferric hypophosphite be rubbed with sodium citrate 30 c.c. of water added; mixture warmed with stirring when a greenish solution will be formed. Then the remaining hypophosphites should be dissolved in 450 c.c. of water with the addition of 2 c.c. of the acid and then the quinine along with the remaining 3 c.c. of acid in 30 c.c. of water. Mix both solutions, add sugar. To give a rosy appearance, add a gram. of cochineal. Add water to make 1000 grams. Filter. *Excellent for making bones and brain of children as well as the adults, and for increasing the strength of the blood. Rickety children will be greatly benefited.*

Toothache Preventive.—According to a writer in a monthly magazine, America, by the continued use of the following tooth powder he was free from toothache for 20 years upto the time of writing: Let the teeth and gums be rubbed with sulphur with rather a hard tooth brush before retiring to bed. No meal or milk later on till next morning. No bad odour in the mouth left. A good preservative.

TURNIPS, PICKLE OF

Pickle of turnips is greatly relished even by the most fastidious well-to-do people. The true birthplace of this pickle is perhaps Lahore, from where it is sent by rail to many different places in India. For pickling, the best variety of turnips should be selected. The Delhi variety is hopeless for this purpose.

Peel and slice 5 seers of turnips. Then get ready syrup from 1¼ seer of the best variety of molasses or gur; 10 tolas of garlic; 20 tolas green or fresh ginger, 20 tolas, turmeric, 20 tolas of mustard; 20 tolas of salt, 20 tolas of chillies; 10 tolas of pepper; 5 tolas of cardamom seeds, 5 tolas of black cumin; 50 tolas of colza oil. *(For explanation and vernacular names of the ingredients, consult Directory.)*

Fry finely pounded garlic, turmeric, and cumin in 10 tolas of the oil; add the remaining oil, and then the remaining lot. The spices should be in a fine state of division. Let boil for some time. Take off the fire. Pour this mass over the slices of turnips in a glazed jar. Ready for use in a few days.

Umbrella, To make Waterproof.—Wash the cloth on either side with a solution of potash alum (1: 10); then with soap solution which can be very easily made by boiling light-cloured resin, 1, crystals of sodium carbonate, 1, and water, 10, till the resin is completely dissolved. This soap can be separated by adding some powder of salt (sodium chloride). This soap should be then dissolved along with 1 part of soda soap and 30 of water by boiling. Sponging with this soap solution being over, stretch the umbrella open and carefully rinse the umbrella on both sides.

Venice Turpentine: Dissolve 1 lb. of rosin over a gentle heat by means of a water bath in 2 quarts of spirits of turpentine. When cool will be fit for use.

Vinegar Sugar.—Take 1 seer of brown sugar for every gallon of water Add a little yeast. Put it in the sun for 6 months in a vessel partly closed. Add more water if too much evaporation. Ready made cane-juice may be taken instead of brown sugar.

Vinegar, German: Soft water, 15 gallons; brown-sugar, 2 seers; cream of tartar, 1 powa; whisky, 2 gallons. Mix well. Keep in a warm room. Cover the pot tightly.

Water-proof Black Cloth for Packing.—*Ingradients*: Resin, 14; black paint in paste, 4; boiled linseed oil, 1¼; coal-tar naptha, 5. Melt resin in a pan over fire. Remove and gently stir in naptha, and last of all boiled oil. Let the black paint thinned with coal-tar naptha, and the two mixtures mixed together intimately. Apply warm with a thick paint bursh. Will given good gloss. Keep paint in air-tight containers, otherwise it will be soon spoiled.

Water-proof cum Fire-proof Cement for Roofs of Houses.—Slake quick-lime in a big barrel with boiling water, cover the barrel to prevent steam from escaping. Pass the slaked lime thus made through a fine sieve to get fine flour. Add 2 pints rock salt and 6 bottles of water. Boil the whole mixture when add 1 seer alum, and 8 oz. green vitriol. Then gradually add 12 oz. potash and 8 pints of fine sand or sifted wood ashes. Add any colouring you like. Whitewash the

roof with this preparation. It is claimed that it is as durable as slate and looks better than a paint.

Waterproofing Cloth.—To make cloth stiff, use resin soap (See Chapter VII, P. 90). To get whiter product add a few grains ultra-marine. The cloth used should be of a higher count. Thick grey shirting, calico dasooti or twill will best answer the purpose.

Waterproof Overalls, To make.—Often fancy prices are paid for foreign made overalls. Cheap varieties can be made to stand rain and wet weather. First get an overall made by a tailor. Then lay it flat on the table. Spread ready made pure boiled linseed oil sparingly with a clean paint-brush on the outside. Hang it for 24 hours to dry completely. Then apply as second coat and dry it as above, and then similarly the third coat. While not using it hang it. Never fold or roll it, otherwise it is liable to be spoiled.

White Table Oil Cloths.—Procure dasuti cloth and paint in a warm room a mixture of white-lead ground in sufficient boiled linseed oil, to make a paste with 4 oz. of patent driers, to the pound. Add more linseed oil to make it flow. The cloth should be first coated with glue size or thick paste of starch. The painted cloth should be hung up in a room warmed with flues running along the floor.

Worms, Simple Cure for.—Cut 1 chhtk. of garlic very finely. Put it in 4 chhtks. of warm water. Let remain for sometime strain the liquid into 2 chhtks. of fresh, unsalted butter. Incorporate over hot coals. Apply.

Soldering Iron or any other metal.—(*Cold Process*: Pound well sal ammoniac, 1 oz.; common salt, 1; calcined tartar, 1; bell metal, 1; antimony, 3 over 1 in. thick of Fuller's earth. Let dry. Place the powder within two crucibles and heat over a sand bath by slow degrees. Push on the fire till the mass become red-hot and all melted together. Let cool slowly. Pulverise into a fine powder. When required, place the two pieces to be joined on a table, bringing their ends together as near as possible, making a crust of Fuller's earth so as to hold each piece and pass under the joint, and to open over it on the top. Place some

of the soldering powder between and over the joint. Keep ready some borax well dissolved in hot spirits of wine over a water-bath. Rub your powder with this solution by means of a feather. It will at once boil. When it is all over, the joint will have been soldered. All roughness should be now removed by grinding with a stone.

(1) Take white of 6 eggs. Mix with 10 oz. of pyroligenous acid ; 10 oz. water ; $\frac{1}{2}$ oz. oil of turpentine ; 12 oz. of alcohol.

(2) Spirit of camphor $\frac{1}{2}$ pt. ; tincture of capsicum, (*tel mirach*) 6 oz. ; oil of turpentine, 6 oz. ; linseed oil (*tel alsi*), 2 oz. ; crude petroleum, known as liquid fuel or heavy Diesel Oil $\frac{3}{4}$ pt. ; oil of amber, 1 oz. ; oil of origenum, $\frac{3}{2}$ oz. ; Barbadoes tar, $\frac{3}{4}$ oz. An excellent embrocation for cattle and horses.

SUPPLEMENTARY PHARMACEUTICAL PREPARATIONS

Sulphur Glass, Manufacture of.—Take a brass or any other metallic glass. Smear the inside surface with ghee. Wrap a towel on the outside surface. Put about 8 oz. of sulphur in a glazed earthenware pot or China dish and heat it gently till it is liquified. Pour this liquid into the brass glass and roll it round and round to deposit a layer of sulphur. Stop as soon as the sulphur begins to thicken. Drain off the remaining liquid into the China dish to heat it once more. Repeat this process twice or thrice till the necessary thickness of sulphur glass has been obtained. On its being cooled it can be taken out of the brass glass by gently sliding it outside. *This glass is said to be very useful for drinking milk in and is believed to cure scurvy, itch, and other skin diseases.*

Scabies or Itch, Treatment of.—1. First of all the patient is scrubbed all over the body with soft soap, the parts usually affected being specially thoroughly scrubbed. The patient is then scrubbed again with soap and brush in a warm bath for half an hour, and after being dried the following ointment is rubbed in all over. Sulphur precip., 25 gr. ; Potash, carb, 10 gr. ; paraffine moll. 125 gr. This ointment is left on the body for two hours, the patient being wrapped

in a blanket. After that period the ointment is washed off with soap and water and zinc ointment applied.

2. Precipitated sulphur, balsam of Peru, add $\frac{1}{2}$ dr. beta naphthol, 15 gr.; petrolatum ad 1 oz.

Thorough rubbing of the ointment for three successive nights after hot water bath and scrubbing of the parts. affected, If itching persist apply carbolated vaselene for the balance of a week, at the end of which time, if scabetic lesions are still present the course of treatment may be repeated.

Sulphur Skin Lotion.—Precipitated sulphur, 60 grains; zinc oxide, 120 grains; Eau de Cologne, 6 fl. drs.; glycerine, 6 fl. drs.; carmine, sufficient quantity; rose water, sufficient quantity to produce, 6 fl. oz.

Sweating feet.—Formaldehyde, 10; thymol, 1, boric acid, 24, oxide of zinc, 360, finely powdered starch, 572. Mix well and dust on soles and inside shoes.

Hand Lotion.—The following lotion is excellent for keeping the skin of the hand smooth and flexible during cold weather :—

Tr. benzoin comp., 5.0; glycerine, 15.00; alcohol (957%), 40.00; spt. ammon. aromat, 5.00; aq. q. s. add 90.00.

M. Sig.: Apply to hands after washing and rub in thoroughly

Lime Juice and Glycerine.—(*a*) Almond oil, 14; lemon oil, 4; lime water, 14. Mix well. Add glycerine 4. (*b*) White wax, 1; oil of sweet almonds, 20; lime water, 22; glycerine, 2; oil of lemons, $\frac{1}{2}$. (*c*) Oil of sweet almonds, 1; castor oil, 4; lime water, 5; otto of roses, a little. (*d*) Melt over water bath, white wax, 8; spermaceti, 8. Add oil of sweet almonds, 34; lime juice, 24; glycerate of borax, 8; essence of lemon, 4; essence of bergamot, 1. (*e*) Stearine, 1; paraffin, 2; cocoanut oil, 8; beeswax 4; caustic potash 44 Beu. 0. 5; odourless white oil, 34; water 33. Make a soap like mass of stearine with potash. Add oil. Mix other waxes. Emulsify by warming. Dilute with oil. Add water in cold to emulsify. Let alone. Study how it separates. Add perfume *i.e.*, lemon oil, 3, oil of neroli; 1; oil of lavender, 1; some fixatives, 2.

Whitlow.—Docaine hydrochl, 10 gr.; Sodii chloride, gr. 1; Acid carbolic, mm. 1. Aqua dest. q.s. ad. oz. 1.

M. Sig:—Inject iron into tissue around base of nail. follow by local anesthesia for the purpose of removing nail.

Prickly Heat Cures.—(1) Bismuth subnitrate, 1. (2) Hydrarg-chlor-nit, 1; lycopodii, 6. To be used as dusting powder. (3) Zinc ointment, if tendency to boils. (4) Sulphate of copper, 20 gr.; water, 1 oz., apply frequently. (5) Bicarbonate of potash, 2 dr.; water, 1 pint. (6) Equal parts of sal volatile and water. (7) Alcohol ether, chloroform, each 333; menthol, 1. Apply occasionally.

Bed Sores.—Castor oil, 50 grains; zinc oxide, 40 grains; balsami perci, 10 grains.

Ring Worm Lotion.—Sublimed sulphur, 60 grains; zinc oxide, in powder 120 grains; glycerine 1 fl. dr.; liquified phenol, 1 fl. dr.; oil of bergamot, 20 minims; olive oil, sufficient quantity to produce 4 fl. ozs.

Eczema of the face.—Lactic acid 15 grs.; acid salicylic 2 grs.; aqua ad. 4 oz.; mix. Wash the part with soap and apply.

Freckle.—Zinc oxide, 2 parts; hydrarg-ammoniate, 2 parts; bismuth subnitrate, 2 parts; camphor, 2 parts; pulverised amyli, 2 parts; ointment rose ad. 30 parts; mix.

Warts and Corns.—Will cure in 10 minutes. Place a piece of potash in air until it slacks. Mix it with a freshly made paste of gum arabic. Apply. In all the acute diseases that have an acidosis tendency it is indicated.

Paint for Warts.—Chrysarobin, 1 dr.; salicylic acid, 1 dr.; alcohol, 2 dr.; collodion, enough to make 1 oz. Dissolve the chrysarobin and salicylic acid in the alcohol and add collodion.

Corn Salve.—Salicylic acid, 1 ounce; extract cannabis, 1 dr.; petroleum jelly, 6 ounces. This salve is specially recommended for sale as a low price salve in one drachm tins.

Stramonium Anodyne for irritable ulcers painful piles, and skin eruptions.—Stramonium

leaves, 1 lb.; lard, 3 lb.; yellow wax, ½ lb. Boil the leaves in the lard just to soften them. Strain through linen. Add previously melted wax. Stir well. Let cool. This preparation can prove best seller in the hands of an enthusiastic advertiser.

Healing Salve for cuts, boils, bruises, old sores, inflamed parts, etc.—Simmer over a slow fire for 4 hours, lard, 2; resin, (Canda Behroza), 1; sweet, elder bark, 1. Let it form a hard, brown ointment. Spread on a piece of clean cotton cloth and apply.

INSECT & SNAKE BITES

Insect Bites.—1. Carbolic acid 15 grs.; glycerine 2 drs.; rose water 4 oz.

2. Salicylic acid 115; grs; collodion, 2½ drs,; spirits of ammonia, 5½ drs.

3. Fluid extract of rhus toxicodendron dr,. 1; water 8 ozs.

4. Pecac in powder 1 dr.; alcohol; 1 oz.; ether, 1 oz.

5. Beta-naphthol, 30 grs.; camphor, 30 grs.; lanolin cold cream, 1 oz.

There are various applications recommended for the relief of bites from scorpians, spiders, wasps, and other insects. The most commonly used applications, perhaps are ammonia water, spirits of camphor and water, and Amritdhara. Freshly cut onion also affords great relief.

Anti-Sting Lotion.—Spirit of camphor, 4 fl. dr; spirit of chloroform, 1 fl. oz.; strong solution of ammonia, 4 fl. drs.; solution of hamamelis, 2 fl. oz.; strong solution of lead sub-acetate, 1 fl. oz.; cherry laurel water, 2 fl. oz.; distilled water, sufficient quantity to produce 2 pints.

Sting Reliever.—Strong solution of lead sub-acetate, 2 fl. dr.; strong solution of ammonia, 2 fl. dr.; camphor, 15 gr.; glycerine, 1½ fl. oz.; rose water, 14 fl. oz.

Tic Mixture.—Quinine sulphate 30 grs.; dilute hydrobromic acid, 4 fl. drs.; tincture of gelsemium, 200 minums; comp tincture of cardamoms, 5 fl. drs.; glycerine, 10 fl. drs.; chloroform, 45 min.; water ad. 20 fl. oz.

Specific for Snake-bite.—Take about five tolas of tabacco and mix with ten tolas of water. The liquid portion should be drunk after throwing out the drug. If the man bitten be senseless, pour the water down his throat; if lock-jaw has set in, the liquid should be passed through his nostrils. In about five minutes, the man will commence vomiting, thereby removing the effect of poison with every vomit. In about an hour the man will be all right.

Antidote to Snake-Poison.—According to a writer in Jiwan Tat, the following is a well-tried and efficacious remedy for snake-bites:

Reduce to a fine powder equal quantities of white arsenic, copper sulphate, sal volatile, white *rataks*. Make pills with the help of the milk of *ak* plant. The pills should not be more than 2 grains each. Apply the pill ground with a little water to the bitten part. In case of there being a little wound an incision should be made with a clean and sterelized razor above the bitten part and the medicine applied. If the patient bleed, incisions should be made at all the joints and the medicine applied as indicated above. As an auxiliary, solution of the rind of soap-nuts in water should be administered to induce vomiting and purging. Continue administering the solution so long it does not feel bitter to the patient.

Calomel Treatment of Snake Bite.—According to Dr. Corislano of Brazil persons suffering from snake-bite may be cured in all cases by three doses, at intervals of 2 hours, of 30 gr. of calomel in 1 oz. of lemon juice. He further adds that whoever always carries on his person 75 to 300 gr. of corrosive sublimate, should entertain no fears of serpents. They will run away from him. Should he be bitten, no harm would come to him, of course were he to use the drug as indicated above.

N.B.—It is often the exaggerated fear that kills a person and not the virus itself. When snake poison gets direct into the blood or tends to produce coma it should be neutralised by administering alcohol, digitalis, atropine, nitroglycerine.

Locally 1 percent solution of chromic acid or chloride of gold or potassium permanganate should be

applied. The swollen parts should be massaged and the stomach should be washed.

MEDICAL SUNDRIES & MISCELLANEOUS.

Saffron Plaster.—Melt together beeswax, 250; rosin, 250. Strain through a piece of *khadder*. Dissolve gum ammoniac and purified galbanum, 66 parts each, in 250 of turpentine. Mix with the above, and stir in 66 parts of powdered saffron, mastic and myrrh.

Sticking Plaster.—Boil in copper vessel powdered litharge, 175; olive oil, 300. Add occasionally a few drops of water till a plaster like substance is formed. When whole the water has been evaporated, a greyish-white mass is obtained. Take off the fire, and at once add a mixture of rosin, 200; turpentine, 400. Evaporate with frequent agitation till foam is produced. Let cool, when mould into sticks.

Court Plaster.—Crush sufficient isinglass; soak in water for 24 hours in a small quantity of water. Heat it over a water-bath so as to evaporate surplus water. In the place of the evaporated water, put in proof spirits of wine.

Iodoform Cotton.—Iodoform, 3; methylated spirit, 144; absorbent cotton, 64. Treat as above. See also next.

Chromic Acid.—A very powerful germicide, oxidiser and a bleaching agent. Also used for batteries. By constant stirring, add strong sulphuric acid in a fine stream into a cold saturated solution of potassium bichromate. For every 100 parts of the latter, 48 of the former will be required.

Cream of Tartar.—(1) Mix 300.096 parts of tartaric acid in solution with 138.2 of carbonate of potash. Filter and evaporate the filterate to dryness. Large quantities are obtained from the lees of wine by filteration and evaporation, (2) Digest together purified powdered tartar, 10; water, 10; crude hydrochloric acid, 1 for a day. Stir the solution frequently. Let stand. Filter through linen; wash with ordinary water and then with distilled water so that hydrochloric acid is washed away. Dry the residue.

Silver Nitrate.—It is found in three varieties in the market; opaque white plates or crystals, the purest form of transparent crystals, with some traces of nitric acid; lunar caustic, cylindrical tubes with an admixture of fused copper or silver as used for surgical operations. The first is formed by dissolving pure silver in double its weight of pure nitric acid at 40 Be in glass or porcelain basin in a stink cupboard or open air as the nitrous fumes given off are very noxious. Let stand and cool when crystals will be deposited. Drain off the supernatant liquid, and wash the crystals. Dry in a stove. Store in blue or green phials free from contact with organic substances.

Lunar Caustic.—Dissolve as above 3 parts of silver in 7 of nitric acid; evaporate to dryness with gentle heat, and melt the mass in a porcelain vessel, Let cool, and dissolve in water, and evaporate to dryness with the addition of one drop of nitric acid; melt the residue and run into moulds.

Moths to keep Away, Powder for.—Powder together equal parts of cloves, cinnamon, mace, pepper, orris root.

Deodorising Tablets.—Melt naphthalin in a pan over a water-bath; add a little camphor. Pour into small moulds as of biscuits. Good for keeping in warm clothes in summer or rains. Not disinfectant, but only deodorant. The strong smell prevents moths from breeding.

White Fumigating Pastils.—Powdered limewood, 8; benzoin, 1; mastic, 1, white Peruvian balsam, ½. Mix with sufficient solution of gum tragacanth to form pastils.

Perfumed Pastils.—Wood charcoal powder, 500; benzoin, 375; tolu balsam, vanilla beans, cloves, 125 each; sandalwood oil, oil of neroli, 3 each; saltpetre. 5; gum tragacanth solution, sufficient.

Nerve Pain Mixture.—Phenacetin, in very fine powder, 60 grains; compound tincture of cinchona, 1 fl. dr.; tincture of orange, 1 fl. dr.; chloroform water, 3 fl. oz.; cinnamon water sufficient quantity. Triturate the phenacetin with the compound tincture of cinchona and tincture of orange; allow to stand for half an hour,

and then add gradually the chloroform water and sufficient cinnamon water to produce 6 fl. ozs. of the mixture. *Dose :* ½ to 1 fl. oz.

Caffeine Lozenges for Hemicrania, hypochondriasis.—Each lozenge should contain ¼ gr. of caffeine and ½ gr. citric acid.

Dipsocure (Certain Cure for Drunkenness) :—Iron sulphate, 5 gr.; magnesia, 10 gr.; peppermint water, 11 dr.; oil of nutmeg, 1 dr. *A tonic and stimulant:* Does away with mental lethargy that follows suddenly giving up drinking. Dose to be increased from 12 mm. on a piece of sugar-candy to two teaspoonfuls twice a day.

Sarsaprilla.—An excellent remedy for the purification of the blood; (*a*) Crush and bruise 4 oz. of sarsaparilla root; add 2 oz. of guaiacum wood. Boil in 3 srs. of water with gentle heat till ½ seer left; add 1 oz. of sassafras wood and 6 drams of liquorice. Take off the fire and strain. (*b*) *Soluble Extract of Sarsaparilla.* Dissolve 5 fluid drms. each of pure oil wintergreen, of sassafras, and of anise, in 1 pint of alcohol, and rub with 2½ oz. of carbonate of magnesia with a pestle and mortar. Pour in a big bottle and add 1 pint of water. Let stand for a week, shaking occasionally. Filter.

Corrosive Sublimate.—Heat equal quantities of sulphate of mercury and common salt in a long tube. The sublimated material will condense in the cold upper portion of the tube.

Potassium Permanganate.—Fuse together 8 parts of black dioxide of manganese with 7 of caustic potash, and 10 of potassium chlorate. Dissolve the manganate so got in water and let carbon dioxide bubble through it. Carbon dioxide can be had from aerated water manufacturers. It may be produced by the action of hydrochloric or sulphuric acid on any carbonate (lime stone, marble, chalk, *kankar*, *cowries* or washing soda). The last gives out carbon dioxide rather too rapidly.

Potassium Carbonate.—Take a wooden cask perforated in the bottom which is covered over with clean straw over which place damp wood ashes collected from the furnaces of confectioners—avoid coal or dung

cake ashes—and dampened with water. Pour water over the ashes several times so that the potash solution trickles down. Let stand and decant the supernatant solution, and boil to turn out the liquid. Burn the solid mass white in a furnace to drive out the inorganic impurities.

As confectioners are now using coke instead of firewood, wood ashes cannot easily be obtained from them.

Animal Charcoal, To prepare.—Boil pieces of bones with a solution of bleaching powder. Wash in clean water. Place with a quantity of sand in closed iron box and heat strongly from below. On plenty of smoke coming out take out the vessel and place the bones in a solution of hydrochloric acid in water (1:6). Boil the whole for several minutes. Take off and wash with cold water. The charcoal so obtained is used for clarifying syrup, refining oil and alcohol.

Absorbent Cotton.—Get cotton of the best white quality. Boil with a 5% solution of caustic soda or potash, say for half an hour; wash thoroughly; macerate in a 5% solution of bleaching powder. Wash it again first with pure water; then with water to which a little hydrochloric acid has been added, and then lastly with pure water again. The whole of the above process, except with bleaching powder, is again to be repeated.

Medicated Cotton with Salicylic Acid.—Dissolve thoroughly well 1 oz. of salicylic acid in 2 of glycerine and 15 of methylated spirit. Take 1 lb. of absorbent cotton and spread it over the mixture in a large enamelled plate. Let stand for sometime to equalise the distribution of the mixture. Roll the cotton into a ball and envelop in clean calico. Introduce into a clean vermicelli press to squeeze out the superfluous mixture. If required, the cotton on being taken out should be enwrapped once more and squeezed, when it should be hung upon ropes in a dust free room to evaporate the spirit. See also the previous.

LINIMENTS.

Belladonna Liniment.—Extract of belladonna; olive oil, 8. Stir well. *Good for rheumatism, neuralgia, inflammation, etc.*

Camphor Liniment.—Used in sprains, contusions, rheumatism. Rub 1 part of camphor with 4 of sweet oil. When completely dissolved add 4 parts of aqua ammonia. Soak thoroughly.

Compound Camphor Liniment.—More effective than the foregoing. Dissolve 5 parts of camphor in 34 of rectified spirit ; add oil of lavender, $\frac{1}{4}$ and aqua ammonia, 6. Mix thoroughly by agitation. Addition of $\frac{1}{4}$ part of tincture of opium will cure severe pains.

Family Liniment.—Tincture aconite, 1 oz. ; chloroform, 3 oz., soap liniment, (*See below*) 16 oz. Very pleasant in its effect. To be used as often as required.

Instant Relief Liniment.—Oil of cloves, 1 ; oil of sassafras, 2 ; spirit of camphor, $1\frac{1}{2}$.

Opium Liniments.—An external soothing application. Mix tincture opium, 2 ; soap liniment, 6. (*See Next*).

Pleurisy Liniment.—(Equally useful for Rheumatism) : Turpen ine oil, 7 oz. ; aqua ammonia (4 F.) 2, oz. ; camphorated oil, 11 oz. Shake well ; can be used as prescribed. By the addition of a little more ammonia, a stronger liniment will be formed.

Soap Liniment.—Use same as foregoing but not so active. Mix spirit of rosemary, 26 ; distilled water, 4; add camphor, 2. Macerate until a complete solution is obtained.

Turpentine Liniment.—For burns. Mix soft soap, 2 ; camphor, 1 ; oil of turpentine, 6.

Turpentine Liniment B. P.—Oil of turpentine, 16 fl. oz. ; olive oil, 1 fl. oz. camphor $\frac{1}{2}$ oz. ; oil of thyme, 2 fl. oz. ; acetic acid, 5 fl. oz.; yolk and white of 8 eggs.

Dissolve camphor in the oils. Add slowly to beaten eggs, stirring constantly all the time. Add acetic acid last of all. This is as good as Embrocation.

OINTMENTS.

All Kinds of Sores.—(*a*) Heat 8 oz. of sesame oil in an iron kettle. Take off and mix the softer portion of *kaunch* seeds, *neem* leaves and *narmah* leaves, in the form of tablets, and $\frac{1}{2}$ oz. of wax. Heals quickly. (*b*) Resin, 4 oz.; clarified butter, 4 oz.; *katha*, alum., copper

sulphate, ½ oz. each. Mix resin and ghee with a little water for an hour or so and add the other ingredients. (c) Resin, 3⅓; litharge, 1; peeled *kaunch seeds*, 3½; sassafras or *karwa* oil, 6. Mix *kaunch seeds* with oil; heat and clarify by boiling with tablets of *neem* leaves. Add remaining ingredients.

Benzoin Ointment.—Tincture benzoin, 1; lard, 4. Melt the lard and stir in the tincture. For *itch and skin diseases.*

Black Ointment.—Oil of vitriol, 1; olive oil, 8; turpentine, 4. Mix acid with oil by stages. On cooling, add turpentine. A very good counter irritent; efficacious in swelling of joints. To be applied twice daily on lint.

Bostock's Eye Ointment:—This ointment stated to be manufactured by a limited company with an address in London, is sold in a pot containing half an ounce, and costing 1 s. 1½ d. It is described on the label as "An invaluable remedy for every disease to which the Eye is subject. Determination of the amounts of the respective ingredients indicates the following approximate formula:

Ammoniated Mercury	0.88	per cent.
Lead Oxide (Litharge)	0.15	„
Glycerine	0.25	„
Extractive, ...	3.32	„
Spermaceti	31.00	„
Soft Parraffin	31.00	„
Lard	31.40	„

Neglecting the extractive, the estimated cost of the ingredients for half an ounce is under one-half penny." —*Commerce and Industry.*

Belladonna Ointment.—Belladona, 2 dr.; aconite liniment, 1 dr.; carbolic acid, 5 drops; flexible collodion, 1 oz.; mix. Apply at night with a camel hair brush.

Broken Chilblains.—Locatelli Balsam, 1 oz.; citrine ointment, ¼ oz.; balsam of Peru, 20 drops.

Calomel Ointment.—Calomel, 1; spermaceti cerate, 7. *Useful for ringworm and other skin diseases accompanied with severe itching.*

Cucumber Ointment:—Oil of sweet almonds, 112; spermaceti, 18; white wax, 5; glycerine, 16; green cucumbers, 64. Cut the last into very thin slices; mix in a wooden mortar. Do not strain. Let stand in juice so pressed out for 12 hours. Then press through a vermicelli press. Strain. Melt the first three; add the strained juice from cucumbers. Stir well. Let harden in a cool place; beat with a wooden spatula so as to separate the watery part from the ointment; Such water should be thrown away. Mix glycerine with the remaining lot without heating. Rub with hands. Store in 4 oz. wide-mouthed jars or bottles. Cover with rose water. Store in a cool place. Will keep for a year. *A fine emolient for the skin. See also Cucumber Cold Cream.*

Eczema Ointment.—(1) Mix together equal parts of sulphur, boric and zinc ointments.

(2) Acid salicylic, 13; ointment of zinc oxide, 80; hydrous wool fat (lanolin) 80; lime water, 4 oz. Make 600 parts.

Gall-nut Ointment.—For piles, to stop bleeding and as astringent and soothing: Powdered gall-nuts, 10; lard or vaseline, 50, powdered opium.

Hops Ointment.—Hops, 2; lard, 10. Very good for painful piles and gangerine sores.

Iodoform Ointment.—Iodoform, 1; vaseline 16. Let the finely powdered iodoform be incorporated with vaseline with heat. *Antiseptic; good for all kinds of sores.*

Inflamed Eyelids, Sore Nipples, Ringworm, Small white Eruptions, Prickly Heat.—Zinc Ointment. Mix well oxide of zinc, 1: vaseline, 6.

Magic Oil.—Sweet oil, 6 bottles; hemlock, 2 oz.; oil of organum, 2 oz.; choloroform, 2 oz.; spirits of ammonia, 4 oz. Mix. Let stand for a day. *Dose*: internally 1 teaspoonful for adults. Bathe the inflammed part and apply the oil externally. Efficacious for all kinds of pains, rheumatism, neuraligia and

inflammatory diseases. A near approach to Ram Ban Oil

Piles Ointments.—(1) Boric acid, 1 oz.; distilled extract of witch hazel, 4 fl. oz.; yellow soft paraffin, 2 lb.

(2) Calomel, 8 gr.; hydrastin, 8 gr.: hamamelin, 8 gr.; chloretone, 20 gr.; benzoated lard $\frac{1}{2}$ oz.; lanolin, $\frac{1}{2}$ oz.

(3) Glycerine of lead acetate, 2 fl. dr.; cocaine, 6 gr.; morphine, 2 gr.; camphor, 10 gr.; oleic acid, 30 gr.; lanolin, $\frac{1}{2}$ oz.; soft paraffin, 1 oz.

(4) Dehydrated alum, 1; zinc oxide, 1; petrolatum; 14.

(5) Mix together completely 8 gr. of morphia with 1 oz. of spermaceti. Then add finely powdered galls, $\frac{1}{2}$ dr.; oil of almonds, 15 drops. Stir till it becomes sufficiently hard. Very good for *piles, prolapsus*. Would not soil the clothes.

Ringworm Ointment.—(1) Carbonate of soda, pot. sulphate, each 1; creosote, $\frac{1}{4}$; lard or vaseline, 10. (2) Tar, 3; lard or vaseline, 12. Melt together, and incorporate by stirring 2 parts of acetic acid. (3) Grind together mercury, lead chromate, copper sulphate, borax with lemon juice. Apply after scratching the place with a dung cake. (4) Goa powder, 1; vaseline, 3.

Royal Pain-killer.—Alcohol, 20 oz.; tincture capsicum, 3 dr.; turpentine, 1 dr.; camphor, 16 dr.; soft soap, 2 oz.; oil of lemon, 20 mm.

Scrofulous Ulcers and Swollen Joints, Ointment for—(*a*) *Iodide of Lead Ointment:* iodide of lead, 1; vaseline, 8. (*b*) *Iodide of Mercury Ointment:* Mix 1 part of iodide of mercury with 2 of white wax and 6 of lard melted together (*c*) *Iodide of Potassium Ointment:* Dissolve potassium iodide in equal quantity of boiling distilled water. Mix with $3\frac{3}{4}$ parts of lard.

Skin Diseases and Itch, Ointment for.—(*a*) *Iodide of Sulpher Ointment:* Mix 1 part of iodide of sulphur in 16 of lard, (*b*) *Sulphur Ointment:* Rub together 1 part of sulphur flowers with 2 of lard. To

be used morning and evening. (*c*) *Compound Sulphur Ointment:* Mix well flowers of sulphur, 1; powdered white hellebore, 1; saltpetre, ½; soft soap, 4; lard, 12. Use as (*b*) (*d*) *Tar Ointment:* Melt together equal quantities of tar and lard and press through a *khaddar piece.*

Syphilitic Ulcers.—Karwa oil, 3; verdigris (*zangar*), 4; soapstone, 3; wax, 3.

Ulcerated Eyes.—Mix ammoniated mercury, 1 part, in vaseline, 98 parts, and use on the lid margins.

TINCTURES AND ELIXERS.

When the active principle or juice of a plant, of its leaves or petals, is added to alcohol, it is called a tincture. They are obtained by maceration of the plant and then by percolation and filteration. They may be distinguished from the essences, in as much as the former are for the medicinal purposes, while the latter for flavouring or for perfuming. In general any tincture may be made with 1 oz. of the gum, root, bark, leaves or flowers with 1 pt. of proof spirits. Elixers are mixtures of syrup and aromatic wines or tinctures. They are palatable. Dose of elixers is generally 1 to 2 tea spoonfuls.

Absolute Alcohol.—(*a*) Suspend gelatine in ordinary alcohol when the former will absorb its water. Decant. (*b*) Make a solution of 100% solution of silver nitrate. Add this solution to 11,428 gallons of crude spirit when it becomes high proof spirit or rectified spirit. 7 grains of nitrate of silver will remove bad odour even from 100 gallons of the purest quality. (*c*) Pour by constant agitation strong alcohol over amorphous or anhydrous sulphate of copper till a blue tint is obtained. Decant and then distil.

Consult also 'industrial Alcohol' Its manufacture and Uses; by J. K. Brachogel (Munn & Co., N.Y.)

Aconite (1) Powdered (aconite meetha telia), 1; alcohol, 24. Soak to soften in 18 parts of alcohol. Stir again and again. Put in a percolator. Let drain. Then pour into the percolator the remaining alcohol. Then press the refuse from aconite, and add more

alcohol to make 16 pints. *Dose*: 5 to 15 mm. Twice or thrice a day. (2) Aconite, bruised, 1 rectified spirit, 3. Macerate for a week. Rub, press and filter.

Aloes: Aloes, 1; extract of licorice, 3; alcohol, 40. Macerate for a week; press and filter. Wash the refuse with alcohol, to make 40 parts. *Aperient, laxuative. Dose:* 1 to 2 dr.

Arnica.—Flowers of arnica montana, 7; spirits (sp. gr. 900) 32. Digest for a week. Strain with expression. *Dose*: 10 to 30 mm. Good for diarrhoea, dysentry, gout, rheumatism paralysis. Mixed with water, a very good application for burns and inflamed boils. Used by homeopaths also.

Aromatic.—Coarse powders of cinnamon, 4; cardomom, 1; cloves, 1; galangal root, 1; ginger, 1; proof spirits, 50; macerate for a week. Strain. Good for *digestion and for flavouring*.

Belladonna.—Dried leaves of belladonna in coarse powder, 1; alcohol, 20. Macerate for 2 days in 15 parts of alcohol. Agitate now and then. Put in a percolator and treat as in aconite above. Add remaining spirit, and make up the 20 parts. *Dose*: 5 to 20 mm.

Benzoin.—(1) Tincture Benzoin is prepared by dissolving 2 oz. gum benzoin in 20 fl. oz. 90 per cent alcohol.

Tincture Benzoin Composita.—Prepared as follows:

Benzoin, 2 oz.; Aloes, 175 gr.; Storax, 1½ oz. 90 per cent; Balsam of Tolu, ½ oz. 90 per cent. alcohol to make 20 oz. (fl).

Buchu.—Bruised buchu, 1; proof spirits, 8. Soak in three-fourths of the spirit for 2 days. Treat as Aconite by addition of more spirit, make 8 parts. *Dose*: 1 to 2 dr.

Cantharides.—Cantharides, bruised powder, 1; proof spirits, 80. Soak for a week in a closed vessel stirring now and then. Treat as Aconite. Make 80 parts by addition of spirit. *Dose*: 5 to 20 mm.

Capsicum.—Crushed capsicum, 1 ; rectified spirit, 27. Soak for 2 days. Treat as aconite. *Dose:* 10 to 20 mm. Atonic dyspepsia, scarlet fever, ulcerated sore throat, 5 to 10 mm. Used as gargle also.

Catechu.—Pale catechu, 5 ; crushed cinnamon, 2 ; proof spirits, 40. Treat as aconite. *Dose :* ½ to 2 dr.

Celery Elixir.—Juniper berries, angelica root, lovage root, each 1, alcohol, 12; orange flower, 4 ; rose water, 4 ; spring water sufficient. Distil 20 parts and mix with 12 parts of honey. Dose 1 to 2. dr. Useful for *sexual debility, loss of manhood. Produces virility.*

Chloroform.—Chloroform, 2 ; alcohol, 8 ; compound tincture of cardamoms, 10. *Dose :* 10 to 20 mm.

Cinnamon.—Crushed cinnamon, 4 ; glycerine, 5 ; alcohol, 80. Digest for a week. Used as *cordial, aromatic, stomachic.*

Cloves.—Cloves, 7 ; proof spirits, 30, water, 10. Digest for a week ; strain and bottle. *For flavouring.*

Colchicum.—Colchicum seeds, cruished, 55 aromatic spirits of ammonia, 40. Treat as Cloves. *Dose :* 20 mm. to 60 mm. in Gout etc.

Cubebs.—Powder of cubebs, 1 ; rectified spirit, 8. Treat as aconite. *Dose.* 1 to 2 dr.

Digitalis.—Digitalis freshly dried in fine powder, 2 oz. ; diluted alcohol sufficient. Moisten with equal quantity of spirit. Pack in a conical percolator and go on pouring more of alcohol till 16 oz. of tincture extracted. *Dose :* 10 to 20 mm. Only medical men should use it otherwise overdosing may produce vomiting, purging, giddiness delirium and even death. Useful as *stimulant, dropsy, palpitation of the heart.*

Iodine (Weak).—Dissolve 25 parts each of iodine and potassium iodide in 25 parts of distilled water ; add 100 parts of methylated spirit (*for external use only*) or alcohol (*for all uses.*)

Iodine (strong)—Iodine, 100; pot-iodide, 100; distilled water, 100, alcohol, 1000. Prepare as foregoing.

Iodine Decolorata.—Dissolve 5 parts of iodine, 55 of rectified spirit with gentle heat on a water bath. Let cool, when add 12.5 parts of strong ammonia solution. Deposit in a warm place or oven till decolorised. Take out and dilute with 200 parts of rectified spirit. This is the best preparation. Saves clothes from being spoiled and exposed parts from being unsightly.

Iodine Decolorata Fortior.—Omit dilution with the rectified spirit in the last place in the foregoing.

Iron Wine.—Ammonia tartarate of iron, 3 drams; sherry, 1 qt. Dissolve. *Dose:* 1 to 5 fl. dr. As a mild *chalybeate.*

Lobelia.—Dry and crushed lobelia, 1; ether, 8. Soak for a week. Press and strain. *Antispasmodic. Dose:* 10 to 30 mm.

Myrrh.—Gum Myrrh, 3; alcohol 20. Macerate, 4 days. Filter.

Opium (Laudanum).—Opium, 3, alcohol, 20 macerate for a week. Filter.

Squill.—Dry and crushed squill, 3; proof spirits, 16. Macerate 2 days with three-fourths of the spirit. Treat as Aconite. Make 16 oz. *Dose:* 15 to 30 drops.

Tolu.—Balsam of tolu, 3, rectified spirits, 3, Dissolve, filter and make up 16 parts. Used for *coughs and colds. Dose:* 15 to 30 mm.

Tonic.—Peruvian bark, crushed, 3; orange peel crushed, 2; brandy, 40. Macerate 10 days. Treat as aconite. Used while feeling languid. *Dose*: 1 teaspoonful in a wine glass of water.

Valerian.—Valerian sufficiently powdered, 3; alcohol to macerate in 1 part. Soak for a week. Make up with alcohol, 20 parts. *Stimulant* and *antispasmodic,* used also in *hysteria* and *epilepsy.*

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PART II

VALUABLE TABLES

USEFUL TABLES.

1. Tables of Weights And Their Equivalents.

Apothecaries Weights :—

Pound	Ounces	Drams	Scruples	Grains.
1	= 12	= 96	= 288	= 5,760
0	1	= 8	= 24	= 480
0	0	1	= 3	= 60
0	0	0	1	= 20

or 20 Grains = 1 Scruple, 3 Scruples = 1 Dram, 8 Drams = 1 Ounce, 12 Ounces = 1 Pound.

Troy Weights :—

Pound	Ounce.	Pennyweight	Grains.
1	=12	= 240	= 5,760
0	1	= 20	= 480
0	0	2	= 24

or 24 Grains = 1 Pennyweight, 20 Pennyweights = 1 Ounce. 12 Ounces = 1 Pound

Avoirdupois Weights :—

Ton	Hundred-weight. Cwt	Quarters Qrts	Pound Lbs.	Ounces Ozs	Drams Drs.
1	= 20	= 80	= 2,420	= 35,840	= 5,73,440
0	1	= 4	= 112	= 1,792	= 28,672
0	0	1	= 28	= 448	= 7,168
0	0	0	1	= 16	= 258
0	0	0	0	1	= 16

or

16 Drams .. .. 1 Oz.
16 Ounces .. 1 Lb.
28 Pounds . .. 1 Qr.
4 Quarters .. .. 1 Cwt.
20 Hundredweights .. 1 Ton.

Troy	Avoirdupois oz.	Dr.
1 Pound .	=13	2.65
1 Ounce	= 1	1 55

Troy	Avoirdupois. oz	Drm.
1 Pennyweight (dwt.) ..	0	0·877

Apothecaries	Lb	Oz.	Dr.	Sc.	Gr.
1 Pound .	=1	0	0	0	0
1 Ounce .	=0	1	0	0	0
1 Pennyweight	=0	0	0	1	4
1 Grain ..	=0	0	0	0	1

Apothecaries	Avoirdupois Oz.	Dr.
1 Pound	= 13	2 65
1 Ounce	= 1	1.55

Apothecaries	Avoirdupois Oz	Dr.
1 Dram	0	2 19
1 Scruple	0	0.73

Troy	Lb.	Oz.	Cwt	Gr.
1 Pound	= 1	0	0	0
1 Ounce	= 0	1	0	0
1 Dram	= 0	0	2	12
1 Scruple	= 0	0	0	20

Avoirdupois.		Troy			
		Lbs.	Oz.	Dwt.	Gr.
1 Ton	=	2,922	2	13	8
1 Hundredweight ..	=	146	1	6	16
1 Quarter	=	34	0	6	16
1 Pound	=	1	2	11	16
1 Ounce	=	0	0	18	5½
1 Dram	=	0	0	1	311.32

Apothecaries.

	Lb	Oz.	Dr	Sc.	Gr.
1 Pound	= 1	2	4	2	0
1 Ounce	= 0	0	7	0	171½
1 Dram	= 0	0	0	1	711.32

Tables of Measures :—

Gallon.	O.	F. oz.	F. dr.	Minims.
1	= 8	= 128	= 1,024	= 61,440
0	1	= 16	= 128	= 7,680
0	0	1	= 8	= 780
0	0	0	1	= 60
0	0	0	0	1

Imperial Standard Measures :—

Gals.	Qrt	Pt.	F oz.	F dr.	Minims.
1	= 4	= 8	= 160	= 1,280	= 76,800
0	1	= 2	= 40	= 320	= 19,200
0	0	1	= 20	= 160	= 9,600
0	0	0	1	= 8	= 480
0	0	0	0	1	= 60

or—

60 Minims	.. 1 F. dr.	2 Pints	.. 1 Qt.
8 F. drs.	.. 1 F. oz.	4 Quarts.	.. 1 Gal.
20 F. ozs	.. 1 Pt.		

United States Apothecaries			British Imperial			
			Pt.	F. oz.	F. dr.	Drops.
1 gallon	= 83311	Imperial gal or .	6	13	2	22 85
1 Pint	= 83311	Imperial pint or ..	0	16	5	17.86
1 F. oz	= 104139	Imperial F oz. or ..	0	1	0	19 76
1 F dr.	=1.04139	Imperial F dr or ..	0	0	1	2 48
1 minim.	=1.04139	Imperial min. or ..	0	0	0	1 04

EXCHANGE TABLE

Metric System of Weights and Measures

Liquid Measures "American" to "Metric"

	Deciliter	Liter.	Hectoliter
Pint	4 7318		
Quart, (2 pints) ..	9.4635	0.9463	
Gallon, (4 Quarts) ..	..	3 7854	
Barrel, 31½ gallons ..	..	..	1.924

"Metric," to "American."

	Pint	Quart.	Gallon.	Barrel
Deciliter	0.2114	0.1057	..	.
Liter	2.1137	0 0567	0 2642	..
Dekaliter	.	..	2.6417	.
Hectoliter	..	..	.	0 6394

Dry Measures—" American " to " Metric "

	Liter.	Dekaliter.	Hectoliter.
Pint	0 5506	..	..
Quart, 2 pints	1 1012	..	..
Peck, 8 quarts	8 8100	0.8810	..
Bushel, 4 Pecks	..	3.5240	0.3524

" Metric " to " American "

	Pint.	Quart	Peck.	Bushel.
Liter . .	1 8161	0.9081	..	..
Dekaliter . ..	18 1611	9.0806	1.1351	0.2838
Hectoliter	..	..	11.3507	2.8377

Weights—Avoirdupois—" American " to " Metric "

	gram	kilogram	Quintal	Tonneau.
Dram	1 7716	..	..	..
Ounce, 16 drams	28 3495	..	..	..
Pound, 16 ounces	.	0.4536	..	..
Ton, 2,000	.	..	9.0718	0.9072

" Metric " to " American "

	Dram.	Ounce	Pound.	Ton.
Gram	0.6448	0 0353	..	..
Kilogram	..	35.2739	2 2046	..
Myriagram	..	..	22 046	..
Quintal	..	..	220 4620	..
Tonneau	..	..	..	1.1023

Weights Troy—" American " to " Metric "

	Milligram	Gram	Hectogms.	Killogm.
Gram	64 7989	..	..	..
Pennyweight, 24 grs. ..	..	1.5552	..	..
Ounce, 20 pints	..	31 1035	..	..
Pound, 12 ozs.	..	..	3.7324	0.3732

" Metric " to " American "

	Gram	Pwt	Ounce.	Pound.
Milligram	0 0154	..	..	..
Centigram	0.1543	..	..	..
Gram	15.4323	..	..	..
Hectogram	..	64 3015	3.2151	..
Kilogram	..	..	32 1507	2.6792

Solid Measures.

Comparative Value of Metric to Apothecaries Weights.

1 Dram	4 Grams.	5 Drams	09 50 grams
2 ,, ...	7 9 ,,	6 ,, ...	23 4 ,,
3 ,, ...	11 70 ,,	7 ,, ...	27 5 ,,
4 ,, ...	15.5 ,, or	8 ,, ...	31.10 ,,

Fluid Measures.

Comparative Value of " Apothecaries, " to " Metric "

	Cubic centimeter		Cubic centimeter
1 drams	3 75	5 drams	18 5
2 ,, ...	7.5	6 ,, ...	22 5
3 ,, ...	11.25	7 ,, ...	26
4 ,, ...	15.5	8 ,, or 1 oz.	30

Relation between Avoirdupois and Troyweights.

(i) 1 lb Troy$=12\times20\times24=5760$ grains Troy

1 lb. Avoirdupois $=7000$ grains Troy

$\therefore$ 175 lbs. Troy $=144$ lbs. Avoir.

(ii) 1 oz. Troy$=5760\div12=480$ grains Troy

1 oz. Av $=7000\div16=437\frac{1}{2}$ grains Troy.

From these relations it is clear that (i) a pound of feathers is heavier than a pound of gold, (ii) an ounce of feathers is lighter than an ounce of gold; (iii) an ounce of gold or silver is heavier than an ounce of tea.

Rule—To reduce Avcirdupois weight to Troyweight

Reduce given Avoirdupois weight to lbs Avoir and multiply the result by 7000. The product will be the weight in grains Troy.

(ii) To reduce the Troyweight to Avoirdupois weight.

Rule :—Reduce the given Troyweight to grains and divide the result by 7000. The quotient will be the weight in lbs. Avoir

(i) To reduce Indian weight to Troyweight.

Rule. Multiply the weight in tolas by 180 ; the result will be the weight in grains Troy.

(ii) To reduce Troyweight to Indian weight.

Rule—Reduce the Troyweight to grains, then divide by 180, the result will be the weight in tolas.

To reduce Avoirdupois weight to Indian weight and *vice versa*.

Rule—1 lb $=7000$ grains, 1 tola$=180$ grains

SEE ALSO TABLE No. 33.

Measures of Length.

12 Inches (in)	1 Foot (ft.)
3 Feet	1 Yard (yd.)
5½ Yds	1 Rod, pole, or perch (ps.)
40 Poles (or 220 yds)	1 Furlong (fur.)
8 Furlongs (or 1760 yds)	1 Mile (m.)
3 Miles	1 league.

Note :—5½ yards = 1 pole " means that 11 half yards " make one pole.

Cloth Measures

2¼ Inches	1 Nail
9 Inches	1 Quarter
4 Quarters	1 Yard.
5 Quarters	1 English Ell
6 Quarters	1 French Ell
3 Quarters	1 Flemish Ell

Nautical Line or Measures.

6 Feet	1 Fathom
120 Fathoms	1 Cable length
6080 Feet	1 Geographical mile or knot

Measures of Capacity.

4 Gills	1 Pint (pt)
2 Pints	1 Quart (qt)
4 Quarts	1 Gallon (gall)
2 Gallons	1 Peck (pk.)
4 Pecks	1 Bushel (bus.)
8 Bushels	1 Quarter (qr).
5 Quarters	1 Load (ld.)
2 Loads	1 Last (last.)
36 Gallons (of beer)	1 Barrel (bar)
54 Gallons (do)	1 Hogshead (Hhd.)
63 Gallons of wine	1 Hogshead
126 Gallons (or 2 Hhds)	1 Pipe of wine

Note.—A gallon contains ten pounds weight of distilled water
(1) A pint of water weighs a pound and a quarter
(2) A gallon contains 227.274 cubic inches.
(3) A cubic foot of water weighs about 1000 oz. Avoir ($62\frac{1}{2}$ lbs.)

2. TABLE OF RELATIVE DISINFECTANT VALUES

(Gardner)

Mercuric Chloride	750
Formic Aldehyde	10
Lysol	10
Carbolic Acid	8
Creolin (cyllin)	6
Jeyes Fluid	6
Walkers' I. X. L.	3
Condy's Fluid	1
Sanitas Fluid	1

3. SURFACE AREA OF SOLIDS

Area of Cylinder .. = Circumference of base multiplied by height, plus area of ends ($2\pi rh + 2\pi r^2$)

Area of Cone .. = Half circumference of base multiplied by slant height plus area of base ($\pi rbL + \pi r^2$)

Area of Sphere .. = $\pi \times 4$ times radius squared ($4\pi r^2$)

4. AREAS OF PLANE FIGURES.

$\pi = 3.1416$ ($\frac{22}{7}$ roughly)
b = base
h = perpendicular height.
L = slant height.
a, b, c = sides of triangle.
s = 1 perimeter.
r = radius.

Area of Rectangle or Parallelogram = Base multiplied by perpendicular height (hb)

Area of Triangle = $\frac{1}{2}$ base $\times$ altitude $\frac{(h \times b)}{2}$

Area of Triangle in terms of sides = Square root of product perimeter and $\frac{1}{2}$ perimeter less each side in turn $\sqrt{s(s-a)(s-b)(s-c)}$

Area of Trapezoid .. = $\frac{1}{2}$ sum of parallel sides multiplied by height.

Area of Rhombus .. = half product of diagonals.

Area of any rectilinear figure = Divided into convenient figures; proceed as above.

Area of Circle = π multiplied by square of radius (πr^2) or multiply the circumference by half the radius; or multiply the square of the diameter by 3·7854.

5. RELATION OF METRIC & IMPERIAL MEASURES

Mass.

1 Milligram (0.001 gramme)	= 0 015 grain
1 Centigram (0·01 „)	= 0 154 „
1 Decigram (0 1 „)	= 1·543 grains
1 Gramme (1.0 „) about 1 masha)	= 15·432 „
1 kilogram (1000 grammes) about 82 tolas	= 35·274 oz. or = 2 2046 lb.
1 Grain	= 0 0648 gramme
1 Oz. (avoir)	28 350 grammes
1 Pound (avoir.) about 38 tolas	= 453·59 „

Capacity

1 Millilitre	= 16·9 minims.
1 Litre	= 35·196 fl. oz. or 1·76 pints.

Length

1 Centimetre	= 0·39370 inches
1 Metre	= 39·370113 ,,
1 Inch	= 25·3999 millimetres

6. RELATIVE SOLUBILITY OF GASES.

One volume of distilled water at 0°C and 760 mm pressure will dissolve

Hydrogen	0·0193 volume
Nitrogen	0 02035 ,,
Oxygen	0·04114 ,,
Nitrous Oxide	1·3052 ,,
Carbon Dioxide	1·7967 ,,
Hydrogen Sulphide . ..	5 3706 ,,
Sulphur Dioxide . ..	79·789 ,,
Ammonia	1148 8 ,,

7. CALCULATION OF PROFIT ON COST AND RETURN.

	On cost		On return
One half	50 0 per cent	=	33 per cent
,, third	33.3 ,,	=	25 ,,
,, fourth	25.0 ,,	=	20 ,,
,, fifth	20 0 ,,	=	16 6 ,,
,, sixth	16 6 ,,	=	14 3 ,,
,, seventh	14 2 ,,	=	12·5 ,,
,, eighth	12 5 ,,	=	11·1 ,,
,, ninth	11.1 ,,	=	10·0 ,,
,, tenth	10.0 ,,	=	9·1 ,,
,, eleventh	9 1 ,,	=	8·3 ,,
,, twelfth	8 3 ,,	=	7 7 ,,
,, thirteenth	7 7 ,,	=	7.1 ,,
,, fourteenth	7 1 ,,	=	6 6 ,,
,, fifteenth	6 6 ,,	=	6·2 ,,
,, sixteenth	6 2 ,,	=	5 8 ,,
,, seventeenth	5 8 ,,	=	5 5 ,,
,, eighteenth	5 5 ,,	=	5·2 ,,
,, nineteenth	5 2 ,,	=	5 0 ,,
,, twentieth	5 0 ,,	=	4 7 ,,

8. VOLUMES OF SOLIDS.

Volume or contents of Cone $\Big\} = \Big\{$ $\frac{1}{3}$ area of base multiplied by perpendicular height $\frac{(\pi r^2 h)}{3}$

Volume or contents of Cylinder $\Big\} = \Big\{$ Surface area multiplied by height $(\pi r^2 h)$

Volume or contents of Sphere $\Big\} = \Big\{$ Surface area $\times$ 1 radius $\frac{(4\pi r^3)}{3}$

Contents of Barrel $L\,(39\,B + 26H + 25\,BH) \times 0.000031473$ gal.

Where L—length in inches of barrel (inside).

B—greatest diameter in inches (inside).

H—diameter in inches of head (inside).

9. AVERAGE COMPOSITION OF WINE.

Name	Alcohol Per cent	Extract Per cent.	Sugar Per cent.
French Red Wines	7 5	2·7	0·4
Spanish „	12 5	3·9	0·5
Italian „	10 0	3 3	0·5
California „	10·0	2·1	0·5
Port Wine, Sweet	16·2	8·2	6·0
Sherry Wine „	15 5	5·0	3·0
Champagne	10 2	8·0	7·0

10. USEFUL DATA.

Weight of 1 c c. Dry Hydrogen at 0°C. and 760 mm. pressure	= 0·0000896 gramme
Weight of 1 c.c. Dry Air at 0°C. and 760 mm.	= 0·0012937 „
One gramme of Hydrogen at 0°C and 760 mm. measures	=11·16 litres
One gramme of Air at 0°C. and 760 mm. measures	= 0.773 „ „
Specific gravity of Hydrogen (air as unit)	= 0·0693
Specific gravity of Air, (hydrogen as unit)	=14·43
Weight of 1 c c. Mercury at 0°C.	=13·596 gramme
Co-efficient of expansion for Gas $\frac{1}{273}$	= 0·003665 for 1°C.

11. SPECIFIC VOLUME OF CERTAIN LIQUIDS.

Volume occupied by 1 lb. Avoir at 15 5°C 70°F.	Fluid ounce of water
Acid hydrochloric (3179%)	13·792
„ Nitric (70%)	11·267
„ Sulphuric (98%)	8 680
Ether (sp. gr. ·730)	21·920
Alcohol absolute	20·144
Alcohol (90%)	19·164
Benzol	18·256
Glycerine	12·688
Olive oil	17·456
Mercury	1·168
Chloroform	10·736
Simple Syrup	12·016
Carbon Disulphide	12·608

The specific volume is opposite to specific gravity. For example, from the above table it will be seen that 1 lb. of glycerine will occupy as much volume as is occupied by 12·688 oz. of water.

12. AVERAGE COMPOSITION OF BUTTER.

	Per cent.
Fat	80—93
Curd	1—3
Water	5—15
Salt	0—7

13. AVERAGE COMPOSITION OF CEREALS.

Particulars.	Weight of 10 kernels in grammes.	Moisture	Nitrogen (6·25).	Ether Extract	Crude Fibre.	Ash.	Carbohydrates other than crude fibre
Barley unhulled	..	10·85	11·0	2·25	3·85	2·5	69 55
Maize, American	38·0	10·75	10 0	4 25	1 75	1·5	71 75
Wheat	3 85	10 6	12·25	1 75	2 4	1 75	71·25
Buck wheat American	3·0	12 0	10 75	2·0	10 75	1 75	62 75
Rye	2 5	10 5	12·25	1·5	2 1	1·9	71·75
Oats, unhulled	3·0	10 0	12·0	4·5	12·0	3 4	58·0
Rice ,,	3 0	10 5	7 5	1 6	9 0	4 0	67·4
Rice hulled but not polished	2 5	12 0	8 0	2·0	1 0	1·0	76·0
Rice hulled and polished	2 2	12·4	7·5	0·4	0·4	0·5	78 8

14. AVERAGE COMPOSITION OF FLOURS.

	Moisture.		Ash.		Nitrogen (6·75)		Fibre.		Ether Extract		Nitrogen free extractive.	
	Max.	Min.	Max.	Min	Max	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Wheat	15 0	9 0	0 8	0 3	15·0	8 0	1·0	0·1	2 0	0 5	90 0	82·0
Rye	14 0	12 0	1·5	0 5	11 0	6 0	0·6	0·4	1 0	0 9	92 0	88 0
Barley	15 0	10·0	2 0	1·0	12·0	8·5	0·6	0·3	2·0	0 8	93 0	84 0
Buck wheat	18 0	12 5	1 5	0·8	9 0	5·0	0·6	0·3	2 0	0·8	93·0	84·0
Rice	15·0	10 0	0 6	0·3	10·0	7 0	0·4	0 1	0 6	0·3	90·0	85·0
Oat	10·0	6·0	2 4	2 0	18 0	14·0	1·4	0·7	9·5	6 5	76·0	72·0
Maize	18 0	8·0	4 5	1 0	11·5	8 0	3·5	0·7	6·0	2 5	80·0	63·0

15. AVERAGE COMPOSITION OF MILK.

Contents.	Woman.	Cow.	Mare.	Goat.	Ass.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Fat	3·3	4·0	1·1	4·3	5·6
Sugar	6·8	4·8	6·7	4·0	4·4
Proteids	1·8	3·5	1·9	4·6	3·8
Ash	0·2	0·7	0·3	0·5	1·0

16. AVERAGE COMPOSITION OF COW'S MILK.

Particulars.	Whole milk.	Separated milk.	Cream.
Specific Gravity	1·032	1·034	1·015
Total Solids	14·10	9·60	26·98
Sugar	4·70	5·05	3·32
Proteids	3·50	3·62	20·2
Fat	5·05	0·20	21·95
Ash	0·79	0·78	0·58

17. AVERAGE COMPOSITION OF CONDENSED MILK.

Contents.	Unsweetened Per cent.	Sweetened Per cent.
Solids	32·0	75·0
Fat	10·0	9·0
Proteids	9·5	9·2
Lactose	11·0	11·5
Sachrose	absent	42 0
Ash	1·5	1·9

18. AVERAGE COMPOSITION OF BREAD.

Contents	Original.	In the dry substance.					
	Moisture	Proteids N×6·7	Ether extract.	Crude fibre	Ash	Salt.	Carbohydrates excluding fibre
Vienna bread	38·71	13 23	1 73	0·97	1·97	0 93	83·1
Home-made bread	33 02	10·8	2 91	0 36	1 55	0·84	84·75
Rye bread	33 42	11 86	1·02	0 95	2·79	1·5	84·36

19. SPECIFIC GRAVITY TABLE.

Metal.	Water at 0°C=1.	Melting Point C.
Aluminium	2·6	658 7
Amber	1 072	—
Antimony	6 7	630
Arsenic	5 9	850
Bismuth	9 8	271
Calcium	1 58	—
Chromium	7·3	—
Coal	1 02	—
Cobalt	8 5	—
Copper	8·9	1083
Cork	0·24	—
Diamond	3 531-3·501	—
Gold	19 3	1063
Glass	2·48	—
Iodine	—	113·5
Iridium	22 4	2300
Iron	7·8	1520
Lead	11 4	327·4
Lithium	0 594	186
Magnesium	8·0	651
Marble	2 83	—
Mercury	13 596	—
Nickel	8 9	1452
Oak	0·84	—
Phosphorus	—	44

Metal.	Water at 0°C=I.	Melting Point C.
Platinum	21·5	1755
Potassium	0 865	62 3
Rubidium	1 52	38
Silver	10·5	690 5
Sodium	0 974	97·5
Strontium	2 54	—
Sulphur	—	112 8
Tin	7·3	231 2
Tungsten	—	3000
Yellow Wine	0·65	—
Zinc	7 1	419·4

N.B—To convert into F° Fahrenheit, multiply by $\frac{9}{5}$ and add 32°.

20. TABLE OF SPECIFIC GRAVITIES OF FIXED OILS AND FATS WITH THEIR CONGEALING POINTS.

Particulars.	At 15·50°C	Congealing point.
Almond Oil	0·915—0·920	Not below 20°C
Arachis Oil	0 916—0 922	..
Cacoa Butter	0 945—0 976	...
Castor Oil	0·950—0 970	Turbid at 0°C. Solid at 18°C
Cocoanut Oil	0 925 (at 18 c)	
Cotton Seed Oil	0·922—0 93	Begins at 12°C
Lard	0 931—0·0938	
Linseed Oil	0·930—0·940	Below —20°C.
Olive Seed Oil	0 914—0 918	Begins at 10°C.
Rape Oil	0·913—0 917	....
Sesame Oil	0 920—0·924	About —5°C
Tallow	0·893—0·898 (at 100 C.)	....

21. TABLE SHOWING CHANGE OF SPECIFIC GRAVITY IN EXPRESSED OILS BY KEEPING (At 15·5°C)

Particulars.	Fresh	After 1 month.	After 3 months.	After 6 months
Arachic Oil	0 9209	0 9213	0·9233	0 9267
Cotton Seed Oil	0·9225	0 9237	0·9261	0 9320
Olive Oil	0·9168	0 9187	0·9208	0 9246
Rape Oil	0 9168	0 0183	0 9188	0 9207

22. SPECIFIC GRAVITIES OF LIQUIDS.

Mercury	13·60	Distilled water at 0°C.	0·99
Bromine	2·96	Claret	0·99
Sulphuric Acid	1·84	Olive oil	0·91
Milk	1 03	Turpetine oil	0·37
Distilled Water at 4°C.	1·00	Alcohol	0 80
		Ether	0·72

23. ELECTRICAL UNITS

Coulomb = The unit of quantity = 1 ampere flowing for one second.

Watt = The unit of power = 44 ft lb per minute. Board of Trade unit (B.T.U) = 1,000 watt-hours will keep a 16 candle incandescent lamp alight for about sixteen hours

Farad = The unit of capacity = the capacity possessed by a conductor when change of a 1 coulomb raises its potential 1 volt.

24. COINS USED AS WEIGHTS.

½d	piece	= 85 grains (approx.)	∴ 5 = 1	Ounce.
1d	,,	= 144 ,, ,,	∴ 3 = 1	,,
3d	,,	= 22 ,, ,,	∴ 20 = 1	,,
6d	,,	= 44 ,, ,,	∴ 10 = 1	,,
1/	,,	= 87 ,, ,,	∴ 5 = 1	,,
2/	,,	= 175 ,, ,,		
2/6	,,	½ ounce ,,		

25. ELECTROLYSIS.

Electro—Positive Metals.

Direction of current inside the liquid. ↓

Zinc
Cadmium
Tin
Lead
Iron
Nickel
Bismuth
Antimony
Copper
Silver
Gold
Platinum
Graphite.

↑ *Direction of current outside the liquid.*

Electro-Negative Metals.

Cathode —plate is least attacked
Anode+ ,, ,, most ,,
Current proceeds in the liquid from + to —

26. ELECTRICAL MEASURES.

Volt.—The unit of pressure=Electromotive force=about 92·6 per cent that given by one Daniell's battery cell

Ohm.—The unit of resistance=The resistance offered to the passage of current of electricity by a column of mercury 196 cm long by 1 mm. diameter at the temperature of melting ice.

Ampere.—The unit of current=The current 1 volt driven through 1 ohm.

27. SOLUBILITY TABLES.

S. V. R.—90% Alcohol. Glyc=Glycerine.=Chlor—Chloroform.

Name.	In Distilled water. At 15·5 C.	In Distilled water. At 100 C.	In other liquids, etc.
Acetanilide	1 in 190	1 in 18	1 in 4 S. V. R.; 1 in 40 glyc.
Acid Arsenious	1 in 100	1 in 20	1 in 8 glyc.
,, Benzoic	1 in 420	1 in 12	1 in 32 glyc.; I in 3 S V R. or ether; sol. in fats and oil
,, Boric	1 in 25	1 in 3	1 in 4 glyc.; 1 in 30 S.V.R.
,, Camphoric	1 in 160	1 in 10	1 in 1½ S V.R; 1 in 2 ether
,, Carbolic	1 in 13	—	3 in 1 glyc.; 3 in 1 chlor.; 6 in 1 S V.R.; freely in fats and oils; about 5% in soft paraffin
,, Chromic	1 in 0·5	—	—
,, Chrysophanic	Insoluble	Insoluble	Sparingly in S V.R.; sol in ether.
,, Cinnemic	Sparingly	Sparingly	Freely in S.V.R.
,, Citric	1 in 0·6	—	1 in 2 glyc.; 1 in 8 ether.
,, Gallic	1 in 105	1 in 3	1 in 6 glyc.; 1 in 8 S.V.R.
,, Oxalic	1 in 10	1 in 3	—
,, Picric	1 in 90	—	1 in 10 S.V R.
,, Pyrogallic	Freely	—	—
,, Salicylic	1 in 550	1 in 9	1 in 195 glyc.; 1 in 1 S.V.R. 1 in 2 ether; 1 in 120 olive oil.
,, Tannic	All proportions	All prop.	All prop. in glyc. & S V.R. on warming.
,, Tartaric	1 in 1	—	1 in 5 glyc.; 1 in 40 ether; 1 in 3 S.V.R
,, Uric	Insoluble	Nearly insol	Insol. in cold S.V.R or ether.
Aconite	Nearly insol.	—	1 in 35 S.V.R.; 1 in 45 ether; 1 in 1 chlor.
Aloin	1 in 120	Freely	1 in 120 S.V.R.

Name.	In Distilled water. At 15·5 C.	In Distilled water. At 100 C.	In other liquids etc.
Alum (Ammonia)	1 in 11	3 in 1	1 in 1½ S.V.R.
,, (Chrome)	1 in 5	1 in 2	—
,, (Potash)	1 in 11	3 in 1	1 in 3 glyc.
Aluminium Sulphate	1 in 1½	—	—
Ammonium Acetate	Freely	—	Freely in S.V.R.
,, Benzoate	1 in 5	Very freely	—
,, Bromide	1 in 1½	—	1 in 15 S.V.R.
,, Carbonate	1 in 4	—	—
,, Chloride	1 in 3	—	1 in 55 S.V.R.
,, Citrate	Freely	—	—
,, Sulphate	1 in 2	1 in 1	—
Amyl Nitrate	Insoluble	—	Freely in S.V.R.
Antifebrin	—	—	See acetanilide
Antimony Tartrate	1 in 17	1 in 2	—
Antipyrin	1 in 1½	—	1 in 1½ S V R.
Angyrol	Freely	—	—
Asprine	1 in 40	—	—
Atropine	1 in 500	—	1 in 3 S.V.R.; in 25 ether; 1 in 52 glyc.; 1 in 15 oleic acid.
Barium Chlorate	1 in 4	1 in 1½	—
,, Chloride	1 in 2½	1 in 1½	—
,, Nitrate	1 in 13	1 in 3	Freely in S.V.R.; sparingly in ether.
Benzonaphthol	Sparingly	—	—
Bismuth Carbonate	Insoluble	—	—
,, Subnitrite	,,	—	—
Borax	1 in 25	2 in 1	1 in 1 glyc.

Name.	In Distilled water, At 15·5 C.	In Distilled water, At 100C.	In other liquids etc.
Bromine	Insoluble	—	—
Butyl Chloral Hydrate	1 in 37	—	1 in 2 ether, 1 in 1 S.V.R o r glyc ; 1 in 20 olive oil.
Caffeine	1 in 68	1 in 1	1 in 40 S.V.R. ; 1 in 7 chlor.
,, Citrate	1 in 32	—	1 in 22 S V.R.
Calcium Carbonate	Insoluble	—	—
,, Chlorate	Freely	—	Freely in S.V.R.
,, Chloride	,,	—	,, ,,
,, Glycerophosphate	1 in 22	—	Less soluble in hot water.
,, Hypophosphite	1 in 8	—	—
,, Iodide	Freely	—	Moderately in S V R.
,, Lactate	1 in 10	Freely	Slightly in S V.R. (only sol. when fresh)
,, Lactophosphate	1 in 30	—	—
,, Nitrate	Freely	Freely	Freely in S.V.R.
,, Oxalate	Insoluble	—	—
,, Phosphate	,,	—	—
,, Salicylate	Sparingly	—	—
,, Sulphate	1 in 500	—	—
Camphor	1 in 700	—	Very freely in glacial acetic ether, S V R., chlor. ; oil of turpentine, 1 in 4 olive oil ; liquifies on rubbing with chloral, thymol, menthol or phenol
,, Monobromated	Sparingly	—	1 in 12 S V.R ; 1 in 1 chlor.
Cantharidine	Nearly insol.	—	1 in 3,000 S V R ; 1 in 84 chlor ; 1 in 40 acetone.
Carmine	Insoluble	—	Soluble in ammonia, and dilute alkalies.
Chloral hydrate	1 in 0·25	—	Very freely in S V.R ; ether or glyc. ; liquifies on rubbing with thymol, menthol, phenol, or camph or.
Chloroform	1 in 160	—	Freely in S.V.R., ether, fats or oils.

Name.	In Distilled water		In other liquids, etc.
	At 15·5 C	At 100 C.	
Cinchonidine	Sparingly	—	1 in 20 S.V.R.
,, Hydrobromide	1 in 40	—	—
,, Hydrochloride	1 in 20	Freely	—
,, ,, acid	Freely	,,	—
,, Sulphate	1 in 100	—	—
,, ,, acid	Freely	—	—
Cinchonine	Sparingly	—	—
,, Hydrochloride	Freely	—	—
,, Sulphate	1 in 66	—	—
Citarin	1 in 2	1 in 15	—
Cobalt Chloride	Freely	—	—
,, Nitrate	Sparingly	—	—
,, Sulphate	1 in 24	—	—
Cocaine	1 in 300	—	1 in 10 S. V.R.; 1 in 12 olive oil; 1 in 4 oleic acid; very freely in chlor.
,, Borate	Freely	—	—
,, Citrate	,,	—	—
,, Nitrate	,,	—	—
,, Salicylate	,,	—	Freely in alcohol
,, Sulphate	1 in 85	1 in 25	1 in 2 S.V.R.; 1 in 30 ether
Copper Acetate	1 in 15	—	—
,, Chloride	Freely	—	—
,, Nitrate	,,	—	Freely in S.V.R.
,, Sulphate	1 in 4	1 in 1	—
Coumarin	1 in 400	—	Very freely in S.V.R or ether
Creosote (Beechwood)	1 in 10	—	In all prop. in alcohol, ether, chlor.; glyc. or glacial acetic acid

Name.	In Distilled water.		In other liquids, etc.
	At 15·5 C.	At 100 C	
Daturine Sulphate	Freely	—	—
Euquinine	Sparingly	—	Freely in S.V.R.
Gold Chloride and Sod. Chloride	Very freely	—	—
Guaiacol Benzoate	Insoluble	—	—
,, Carbonate	,,	—	—
,, Salicylate	,,	—	—
Iodine	Sparingly	—	1 in 10 S.V.R.; sol. in ether and chlor.
,, Trichloride	Insoluble	—	Sol. in Ether, chlor., fats and oils
Iodoform	,,	—	In 95 S.V.R.; freely in ether[1]
Iron and Ammonium Citrate	Very soluble	—	Sparingly in S.V.R.
,, Amm. Sulphate (ous)	1 in 2	Freely	—
,, ic	1 in 6	,,	—
,, Bromide (ous)	Freely	—	—
,, Chloride (ous)	,,	—	—
,, Citrate	,,	—	—
,, Glycerophosphate	Moderately	—	—
,, Iodide (ous)	Freely	—	—
,, Lactate (ous)	1 in 60	—	—
,, Perchloride	Freely	Freely	—
,, and Quinine citrate	Very soluble	—	Sparingly in S V.R.
,, Sulphate (ous)	1 in 2	2 in 1	—
,, ic	Freely	—	—
Lead Acetate	1 in 2	2 in 1	1 in 30 S.V.R.
,, Carbonate	Insoluble	Insoluble	—
,, Chloride	1 in 140	1 in 30	—
,, Chromate	Insoluble	—	—
,, Nitrate	1 in 2	Freely	—

Name.	In Distilled water. At 15·5 C.	In Distilled water. At 100 C.	In other liquids, etc
Lead Oxalate	Insoluble	—	—
,, Oxide	,,	—	—
,, Peroxide	,,	—	—
,, Subacetate	Freely	—	—
,, Sulphate	Sparingly	—	—
,, Sulphide	Insoluble	—	—
Magnesium Carbonate	Insoluble	—	—
,, Chloride	Freely	—	—
,, Citrate	,,	—	—
,, Iodide	,,	—	—
,, Sulphate	1 in 1·3	3 in 1	—
,, Sulphite	1 in 100	—	—
Manganese Sulphate	1 in 1	—	Freely in alcohol, ether; chlor and oils; liquifies on rubbing with phenol, chloral hydrate
Menthol	Sparingly	—	—
Mercury Bromide (ic)	1 in 80	1 in 5	—
,, Chloride (ic)	1 in 16	1 in 3	1 in 4 S.V.R.; 2 in 3 glyc.
,, ,, (ous) calomol	Insoluble	—	—
,, Cyanide	1 in 13	—	—
,, Iodide	V. sparingly	—	1 in 130 S.V.R. 1 in 53 castor oil; 1 in 223 olive oil; 1 in 257 almond oil
,, Nitrate (ic)	Soluble	—	—
,, ,, (ous)	Insoluble	—	—
,, Oxide	,,	—	—
,, Sulphate (ic)	Sparingly	—	—
,, Sulphide	Insoluble	—	—

Name.	In Distilled water. At 15·5 C.	In Distilled water. At 100 C.	In other liquids, etc.
Methal Salicylate	Insoluble	—	Freely in S.V.R.
,, Sulphonal	1 in 220	—	—
Methylene blue	Soluble	—	—
Migrainin	Freely	—	—
Morphine	Sparingly	—	—
,, Acetate	1 in 6	—	1 in 100 S V R.
,, Hydrobromide	1 in 25	—	1 in 50 S.V.R.
,, Hydrochloride	1 in 25	—	1 in 50 S.V.R.
Naphthalene	Sparingly	—	Sparingly in cold, more freely in hot S.V.R.
Naphthol A	,,	—	Soluble in S V.R.
Narcotin	,,	—	In hot S.V.R.
Nickel Bromide	Freely	—	—
,, Chloride	,,	—	—
,, Nitrate	,,	—	—
,, Phosphate	,,	—	—
,, Sulphate	,,	—	—
Pancreatin	Soluble	—	—
Pepsin Scales	,,	—	—
Peptone	Freely	—	Freely in S.V.R.
Phenacetin	Insoluble	About 1 in 100	1 in 21 S.V.R.
Phenazone	1 in $1\frac{1}{2}$	—	1 in $1\frac{1}{2}$ S.V.R.
Phenol (*See* Acid Carbolic)	—	—	—
Phenophthalein	Nearly insol.	Nearly insol.	1 in 10 S.V R.
Phosphorus	Insoluble	Insoluble	1 in 25 chlor.; 1 in 1 carbon disulphide, about 1 in 100 fats and fixed oils; 1 in 200 ether; 1 in 340 S.V.R.

Name	In Distilled water.		In other liquids, etc.
	At 15·5 C.	At 100 C.	
Potassium Acetate	2 in 1	—	1 in 2 S.V.R.
,, Bichromate	1 in 20	1 in 2	—
,, Bicarbonate	2 in 7	—	—
,, Borate	Freely	Freely	—
,, Bromate	1 in 16	,,	—
,, Bromide	1 in 2	—	1 in 200 S.V R.
,, Carbonate	4 in 3	—	—
,, Chlorate	1 in 16	1 in 2	1 in 170 S.V.R.
,, Chloride	1 in 3	Very freely	—
,, Chromate	1 in 2	,,	—
,, Citrate	Freely	—	Sparingly in S V.R.
,, Cyanide (99%)	1 in 2	—	—
,, Ferricyanide	1 in 3	—	—
,, Ferrocyanide	1 in 4	1 in 2	—
,, Fluoride	Freely	Freely	—
,, Glycerophosphate	Very freely	—	—
,, Hydroxide	2 in 1	—	Freely in S V.R.
,, Hypophosphite	2 in 1	—	1 in 8 S V R.
,, Iodide	4 in 3	—	1 in 12 S.V.R.
,, Nitrate	1 in 4	2 in 1	—
,, Nitrite	Very freely	—	—
,, Oleate	Soluble	—	Sol. in S.V.R.
,, Oxalate	1 in 3	Very freely	—
,, Perchlorate	Sparingly	—	—
,, Permanganate	1 in 17	1 in 3	—
,, Persulphate	Slightly sol.	—	—
,, Phosphate	—	—	—

Name.	In Distilled water. At 15 5 c.	In Distilled water. At 100 c.	In other liquids etc.
Potassium Bi-	Soluble	—	—
,, Salicylate	Freely	—	—
,, Silicate	—	Freely	—
,, Stearate	Sparingly	,,	—
,, Sulphate	1 in 10	—	—
,, Sulphide	1 in 3	—	—
,, Tartrate	5 in 3	—	—
,, ,, Acid	1 in 200	—	—
,, Thiosulphate	Freely	—	—
Protargol	1 in 2	—	Soluble in S V.R.
Pyridine Citrate	Soluble	Freely	,,
,, Nitrate	,,	,,	,,
,, Sulphate	,,	,,	1 in 6 S V.R.
Quinine	Nearly insol	—	—
,, Arsenate	Sparingly	Freely	—
,, Arsenite	1 in 150	—	—
,, Benzoate	1 in 350	—	—
,, Citrate	1 in 1200	1 in 30	1 in 45 S V.R.
,, Glycerophosphate	1 in 200	—	1 in 200 S V R.
,, Hydrobromide	1 in 50	—	—
,, Acid	—	—	—
,, Hydrochloric Acid	4 in 3	—	1 in 5 S V R.; 1 in 7 chlor.
,, Hydroiode	Sparingly	—	—
,, Hypophosphite	1 in 70	1 in 15	—
,, Lactate	1 in 3	1 in 1	Freely in S.V R.
,, Oxalate	Nearly insol.	—	—
,, Phosphate	1 in 700	—	—
,, Salicylate	1 in 700	—	1 in 20 S V R.

Name.	In Distilled water. At 15·5 C.	In Distilled water. At 100 C	In other liquids, etc
Quinine Sulphate	—	—	—
Resorcin	Soluble	Freely	1 in 1 S V R , freely in ether ; 1 in 25 olive oil
Rosanilin acetate	Freely	—	Freely in S V.R.
,, Hydrochloride	Sparingly	—	—
Rubidium Salts	Freely	Very freely	—
Saccharin	1 in 375	1 in 30	1 in 38 S V.R ; freely sol. in dilute alkalis
Salol	Sparingly	—	1 in 12 S V R.; 2 in 1 ether, 1 in 12 liquid paraffin or fixed oils.
Santonin	,,	1 in 250	1 in 52 S.V.R.
,, Cyanide	—	—	
,, Nitrate	—	—	
Sodium Acetate	—	2 in 1	1 in 23 S.V.R. —
,, Arsenate	1 in 4	Very freely	—
,, Arsenite	Freely	,,	—
,, Bicarbonate	1 in 12	—	—
,, Bichromate	Freely	—	—
,, Bromate	1 in 3	—	—
,, Bromide	5 in 6	—	—
,, Carbonate	5 in 8	—	—
,, Chlorate	1 in 4	—	—
,, Chloride	1 in 3	—	—
,, Cyanide	Freely	—	—
,, Fluoride	1 in 23	—	—
,, Glycerophosphate	Very freely	—	—
,, Hydroxide	,,	—	—
,, Hypophoshite	1 in 1	—	Freely in S.V.R.
,, Iodide	2 in 1	—	Sol in S V R.
,, Lactate	Freely	—	1 in 4 S.V.R.

Name	In Distilled water. At 15·5 C.	In Distilled water. At 100 C.	In other liquids, etc.
Sodium Nitrate	Very freely	—	—
,, Nitrite	5 in 6	—	—
,, Oleate	Soluble	Very freely	Soluble in S.V.R.
,, Permanganate	Very freely	—	—
,, Phosphate	1 in 6	—	—
,, Salicylate	1 in 1	—	—
,, Stearate	Soluble	Very freely	—
,, Sulphate	,,	,,	—
,, Sulphide	Very Soluble	,,	—
,, Sulphite	10 in 13	—	—
,, Tartrate	1 in 2	—	—
,, Thiosulphate	1 in 1	—	—
,, Valerianate	Freely sol	—	—
Strontium Acetate	Soluble	Freely	—
,, Bromate	1 in 2	,,	—
,, Bromide	1 in 1	,,	—
,, Carbonate	Insoluble	—	—
,, Chlorate	1 in 1	—	—
,, Chloride	1 in 2	—	—
,, Citrate	Sparingly	—	—
,, Iodide	1 in 1	—	—
,, Lactate	1 in 4	—	—
,, Nitrate	1 in 5	—	—
,, Phosphate	Insoluble	—	—
,, Salicylate	Soluble	—	—
,, Sulphate	Insoluble	—	—
Strychnine	Nearly insol	—	1 in 170 S V R.; 1 in 250 alcohol 70 %, 1 in 400 alcohol 60%.

Name.	In Distilled water. At 15·5 C.	In Distilled water. At 100 C.	In other liquids etc.
Sulphonal	1 in 450	1 in 20	1 in 80 S.V R.
Sulphur	Insoluble	—	Sol. in carbon disulphide.
Terpene Hydrate	1 in 250	—	1 in 14 S.V.R.
Theobromine	1 in 1700	—	1 in 16 alcohol 60% very sparingly.
Thymol	V sparingly	—	3 in 1 S. V. R.; liquifies with chloral, phenol, or camphor
Uranium Acetate	Freely	Very freely	—
,, Nitrate	,,	,,	—
,, Sulphate	,,	,,	—
Urea	1 in 1	—	1 in 7 S V.R.
Vanilla	Sparingly	—	Freely in S V R
Zinc Acetate	1 in 3	1 in 1½	1 in 36 S V R.
,, Bromide	Freely	—	—
,, Carbonate	Insoluble	—	—
,, Chloride	2 in 1	—	—
,, Cyanide	Insoluble	—	Soluble in ammonia
,, Iodide	Freely	Very freely	—
,, Lactate	1 in 60	1 in 6	—
,, Nitrate	Soluble	Very freely	—
,, Oxalate	Sparingly	—	—
,, Oxide	Insoluble	—	—
,, Permanganate	V. freely	—	—
,, Phosphate	Insoluble	—	—
,, Salicylate	1 in 25	Freely	—
,, Sulphate	10 in 7	—	—
,, Sulphide	Insoluble	—	—
,, Sulphite	Sparingly	—	—
,, Sulphocarbonate	1 in 2	—	—
,, Valerianate	1 in 90	—	—

28. SOLUBILITIES OF SOME SUBSTANCES WITH RESULTING VOLUME.

	By weight.	Volumes	Volumes
Acid, Citric	100 with	60 water	= 125
,, Tartaric	100 ,,	80 ,,	= 140
Ammonium Bromide	100 ,,	150 ,,	= 200
Borax	100 ,,	100 glycerine	= 172
Chloral Hydrate	100 ,,	25 water	= 82
Iron, Ammon-citrate	100 ,,	50 ,,	= 102
Magnesium Sulphate	100 ,,	130 ,,	= 180
Potassium Bromide	100 ,,	170 ,,	= 200
,, Carbonate	100 ,,	75 ,,	= 112
,, Citrate	100 ,,	60 ,,	= 100
,, Iodide	100 ,,	75 ,,	= 100
Silver Nitrate	100 ,,	50 ,,	= 80
Sodium Bromide	100 ,,	120 ,,	= 150
,, Carbonate	100 ,,	55 ,,	= 95
,, Sulphate	100 ,,	300 ,,	= 350
Sugar	100 ,,	50 ,,	112 5

29. SCALE OF HARDNESS.

Diamond is the hardest known substance Hard substances are usually the most brittle The figures denote the degree of hardness.

1 Talc 2 Rock Salt 3 Calc-spar 4 Fluor-spar. 5 Apatite 6 Felspar 7. Quartz 8 Topaz 9 Sapphire 10 Diamond

Hardness is measured by the power a substance possesses to scratch others

30. MELTING POINTS OF CERTAIN SUBSTANCES.

Alcohol never frozen

Mercury	—38 85°C	Stearine	60°C	Lead	335
Bromine	—125	White wax	65	Zinc	435
Ice	—0	Sodium	90	Antimony	450
Butter	+33	Sulphur	115	Silver	100
Phosphorus	44	Tin	230	Gold	1,250
Potassium	55	Bismuth	265	Iron	1,500

Mixturers and alloys generally melt at a lower temperature than their constituents.

31. BOILING POINTS UNDER PRESSURE OF ONE ATMOSPHERE.

Sulphurous acid	—10	Turpentine	160
Ether	35 6	Strong H_2SO_4	325
Sulphide of Carbon	48	Mercury	350
Bromine	63	Sulphur	447
Alcohol	78·4	Cadmium	860
Distilled water	100	Zinc	1,040

TEMPERATURE TABLE.

N.B.—To change into centrigrade scale, deduct 32 from F° and multiply by $\frac{5}{9}$.

Degree of Fahr.	
2,786	Cast iron melts.
1,996	Copper melts.
1,947	Gold melts.
1,873 . ..	Silver melts.
1,750	Brass (containing 25% of zinc) melts.
1,000	Iron bright cherry red (Poillet).
980	Red heat visible in daylight,
941 . ..	Zinc begins to burn.
773	Zinc melts
644	Mercury boils.
640	Sulphuric acid boils
630	Whale oil boils.
617	Pure lead melts (Rudburg)
600	Linseed oil boils
518 . ..	Bismuth melts.
442	Tin melts.
380	Arsenious acid volatilizes.
356	Metallic arsenic sublimes.
315	Oil of turpentine boils
302	Etherification ends.
257 . ..	Saturated Sol. of Sal ammoniac boils (Taylor).
256 . ..	Saturated Sol. of acetate of Soda boils
239	Sulphur melts (Miller)
238 . ..	Saturated Sol. of nitre boils
221 . ..	Saturated Sol. of salt boils (Paris Codex)
220	Saturated Sol. of alum, Carb. Soda, and Sulph. of zinc boils.
218 . ..	Saturated Sol. of chlorate and prussiate potash boils.
216 . ..	Saturated Sol. of sulph iron, Sulph. copper, nitrate of lead boils.
214 . ..	Saturated Sol. of acetate lead, Sulph. and bitartarate-potash boils.
213 or 213 5 ..	Water begins to boil in glass.
212	Water boils in metal, barometer at 38.
211 .. .	Alloy of 5 bismuth, 3 tin, 2 lead melts.
210	Alloy of 8 bismuth, 5 lead, 3 tin melts (Kane).
207	Sodium melts (Regnault).
185	Nitric acid 1·52 begins to boil
180 (about) ..	Starch forms a gelatinous compound with water.
176	Rectified Spirit boils, benzol distils.
173	Alcohol (sp. gr. 796 to 800) boils.
151 . ..	Beeswax melts (Kane), 142 (Lepage).
150	Pyroxylic spirit boils (Scanlan).
145 . ..	White of egg begins to coagulate.
141 8	Chloroform and ammonia of 945 boils.
132	Acetate (Pyroacetic spirit) boils, (Kane).
122	Mutton, Suet and Styracin melts.
116	Bisulphuret of carbon boils (Graham).
115	Pure tallow melts (Lepage) 92 (Thomson).
112 .. .	Spermaceti and Stearin of lard melts.
111	Phosphorus melts (Miller)

Degree of Fahr.	
98	Temperature of the blood
95	Ether (720) boils.
95	Carbolic acid crystals become an oily liquid
88	Acetous fermentation ceases, water boils in vacuo:
77	Vinous ferm ends, acetous ferm begins.
64 4	Oil of anise liquifies.
59	Gay Laussac's Alcometre graduated at.
55	Syrups to be kept at
30 (about)	Olive oil becomes partially solid
32	Water freezes
5	Cold produced by snow 2 parts and salt 1 part
—37 9	Mercury freezes

—*Cooley.*

33. CONVENIENT MULTIPLIERS.

Feet	×	0·3048	=Metres.
Inches	×	0 0254	= ,,
,,	×	25 399	=Millimetres.
Grain Troy	×	0 0648	=Grammes.
Dwt (Pennyweight) Troy	×	1 555	= ,,
Pounds	×	453·59	= ,,
Millimetres	×	0 03937	=Inches
Metres	×	39 37	= ,,
,,	×	3 281	=Feet
Grammes	×	15 432	=Grains Troy.
,,	×	0 643	=Dwt (Pennyweight).
,,	×	0 0022	=Pounds.
Square Inches	×	00695	=Square feet.
Cubic Inches	×	·00578	=Cubic feet
,, avoirdupois	×	1 2153	=lbs avoir. or apothecary.
,, Troy or apothecary	×	·0829	=lbs avoir.
,, avoir.	×	0 00893	=Cwts.
,, ,,	×	0·000447	=Ton
Seers	×	·9331	=Kilogrammes.
Maunds	×	37 3241	= ,,
Seers	×	20·571	=lbs. avoir.
Maunds	×	82 285	= ,,
Kilogramme	×	1 0717	=Seer.
,,	×	·0268	=Maund
Seer	×	7347	=Cwt.

See also Table No 1

PART III

INDISPENSABLE INFORMATION.

CLASSIFICATION OF MEDICINES ACCORDING TO THEIR EFFECTS.

Antacids	Diuretics
Anthelmintics	Emetics
Antiseptics	Emmenagogues
Astringents	Emolients
Absorbents	Epispastics
Alteratives	Escharotics
Anodynes	Expectorants
Antiarthritics	Febrifuges
Anticonvulsives	Hœmostatics
Antiemetics	Hypnotics
Antiperiodics	Laxatives
Antiphlogistics	Narcotics
Antiscorbutics	Nervines
Antispasmodics	Nutritives
Cathartics	Refrigerants
Cerebro-Spinants	Rubificients
Carminatives	Sialagogues
Chologogues	Sedatives
Deliriants	Stomachics
Demulcents	Suporifics
Diaphoretics	Stimulants
Diluents	Tonics

Absorbents stimulate those blood vessels and glands which work together in absorption. Poisonous or irritant substances are carried off by them. They are used in diarrhœa or vomitting. Antacids (q.v.) and cathartics (q.v.) belong to this class.

Anthelmintics.—Medicines that destroy or turn out worms from the stomach, *e.g.*, calomel, male fern, kuosso, oil of turpentine, pink root, pumpkin seeds, santonin, worm seed.

Alteratives sre used to change the morbid or unhealthy action of the system. Emetics and tonics belong to this class.

Antiarthritics are medicines that tend to cure rheumatism, gout or affections of the joints. Antacids and tonics belong to this class.

Anticonvulsives check convulsive disorders due to blood deterioration, and nervous debility; included in tonics and anodynes.

Antiemitics prevent vomitting; included among stimulants and anodynes.

Antiperiodics have an influence over diseases which are liable to come after a certain period, *e.g.* malarial fevers, largely included in tonics.

Antiphlogistics work against all inflammatory processes. Emetics, cathartics, diaphoretics, diuretics and refrigerants included in this class.

Antiscorbutics check blood derangements due to scurvy; embraced in tonics.

Antispasmodics check spasms and allay nervous irritation; included in emetics and anodynes.

Cathartics exercise a strong action on the bowels; two kinds. 1. Exercise of the purgative; 2. The moderate; *e.g.*, Aloes, Blue Flag, Calomel, Castor oil, Rhubarb, Senna, Rochelle Salts.

Cerebro-spinants.—Medicines which influence the brain and spinal cord. They may be paralysers, stupefaciants or intoxicants; *e.g.*, Aconite, Alcohol, Belladonna, Bromide of Potash, Camphor, Chloral hydrate, Chloroform, Cocaine, Hops, Opium, Morphia, Strychnia, Sulphuric ether, Tobacco, Valerian, etc. Great care should be exercised in using them...

Chologogues are medicines that stimulate the action of liver and increase the flow of bile; included in cathartics.

Deliriants.—Medicines tending to have a sedative influence over the heart and circulation, included in cerebro-spinants.

Demulcents are soothing medicines that protect the air passages from the cold air in colds or obstinate coughs; protect the coating of stomach from the evil effect of corrosive or irritating acid, poison etc., also used to protect the mucous membrane of the urinary organs from acid action of the water in kidneys or bladder troubles; used by the mouth or by injection, arrowroot, gum-arabic, gum acacia, gum tragacanth, licorice.

Diaphoretics.—Medicines which premote perspiration, indicating fever, *e.g.*, Citrate of Potash, Sage, Sweet Spirits of Nite, Sassafras.

Diluents.—Preparations used to quench thirst; dilute and thin the thickened blood, and cool the fever system: pure water, barley water, water gruel, lemonade; tamarind water.

Diuretics influence the kidneys and help increase the flow of urine from the bladder; of great use in most diseases, especially in dropsy, *e.g.*, carrots, cream of tartar, onions, juniper berries, parsley, dandelion, potassium acetate, tar and infusion of water-melon seeds.

Emetics.—Drugs that produce vomitting; very helpful in cases of poison; must not be given to people liable to apoplexy or a tendency to a rush of blood to the head nor again to women in pregnancy, *e.g.*, warm or tepid water, with or without common salt. Ipecac., lobelia, mustard, tartar emetic.

Emmenagogues promote the menstrual discharge, when stopped or suspended *e.g.*, ergot, madder, cotton root. iron, madder root; saffron, pennyroyal also produce similar effect by influencing the general system.

Emolients.—The application of these medicines to the skin has a softening effect, diminishing the pain of inflamed parts and helps suppuration; should be used with poultice, made from flaxseed or meal. Most demulcents when applied to skin act as emolients.

Epispastics.—Substances that produce blistering; *e.g.*, cantharides, mustard and cayenne.

Escharotics.—Caustic drugs that eat off fungoid growths or excessive granulations, *e.g.*, alum, iodine, silver nitrate, nitric acid.

Febrifuges tend to check fever, included among diaphoretics and diuretics.

Hypnotics.—Sleep-producing medicines included in cerebro-spinants.

Hœmostatics.—Medicines which taken internally contract the blood vessels and check bleeding, included in astringents.

Laxatives.—Mild purgatives, *e.g.*, confection of roses, cascara sagrada; warm milk with sweet oil of almonds.

Narcotics are poisonous substances that chiefly influence the brain ; sedatives or stimulants.

Nervines act upon the nerves and soothe the nervous excitement.

Nutritives.—Medicines used for nourishment included in tonics and stimulants.

Refrigerants produce cooling effect on the surface of the body; used in fevers excepting typhoid, *e.g.*, Acetic acid, Vegetable acids, Borax, Citric acid, Hydrochloric acid, Orange, Sandalwood paste, Camphor, Coriander seeds.

Sialagogues—*Medicines* that produce a quick flow of saliva *e.g.*, extract of jaborandi, pyrethrum, tejbal.

Sedatives have a soothing effect on nervous system included in cerebro-spinants.

Stomachics.—Medicines which improve the tone of stomach and promote appetite, included in stimulants and tonics, *e.g.*, dill seed, cardamom, spices, tulsi leaves.

Sudorifics.—Medicines that moisten the skin ; included in diaphoretics.

Stimulants.—Substances that increase vital energy and the force of the action of heart and circulatory system, *e.g.*, aniseed, cod liver oil, coriander, ginger, cayenne pepper, benzoic acid, valerian, myrrh, corrosive sublimate.

Tonics.—Medicines that improve the general tone of system, strengthen and invigorate in weakness, increase the appetite, help the digestion, *e.g.*, arsenic Burdock, Cinchona, Peruvian bark, Iron pepsin, Quinine, Chamomile.

POPULAR NAMES OF MEDICINES,

With their Chemical Equivalents.

For explanations and details consult Part IV Directory.

Acetic Acid	Vinegar.
Anguintum	25 per cent Blue Ointment.
Aqua Fortis	Nitric acid.
Aquila Alba	Calomel.
Balsam Syrup	Syrup Tolu.

Basilicon Ointment	Resin Ointment.
Bitterwood	Quassia.
Black Draught	Comp. Mixt. Senna.
Blue Ointment	Unguentin Hydragerum.
Blue Vitriol	Sulphate of Copper.
Calomel	Chloride of Mercury.
Carron oil	Linseed oil and lime water, equal parts.
Caustic Potash	Hydrate of Potassium.
Chalk	Carbonate of Calcium.
Chloroform	Chloride of Gornuju.
Common Salt	Chloride of Sodium.
Copperas or Green Vitriol	Sulphate of Iron.
Copperas	Ferri Sulph.
Corrosive Sublimate	Bichloride of Mercury.
Cream of Tartar	Bitartartarate of Potassium.
Diamond	Pure carbon.
Diuretic Salt	Acetate Potash.
Dry alum	Sulphate Aluminium and Potassium.
Epsom Salt	Sulphate of Magnesia.
Ethiops Mineral	Black Sulphate of Mercury.
Fire Damp	Light Carburetted Hydrogen.
Friar's Balsam	Tr. Benzoin comp.
Galena	Sulphide of lead.
Glucose	Grape water.
Goulard water	Basic Acetate of lead.
Gregory's Powder	Comp. Rhubarb. Mixt.
Hiera Picra	Confection Aloes in Alcohol.
Holly Drops	Harlem oil.
Iron Pyrites	Bisulphide of Iron.
Jeweller's Putty	Oxide of Tin.
King's Yellow	Sulphide of Arsenic
Lady's Blush	Carmine Powder.
Laughing Gas	Protoxide of Nitrogen.
Lime	Oxide of Calcium.
Lunar Caustic	Nitrate of Silver.
Liver of Sulphur	Potassium Sulphide.
Mosaic Gold	Bisulphide of Tin.
Muriate of Lime	Chloride of Calcium.
Nitre or Saltpetre	Nitrate of Potash.
Oil of Vitriol	Sulphuric acid.
Opodeldoc	Soap Liniment.
Potash	Oxide of Potassium.
Red Lead	Oxide of Lead.
Rust of Iron	Oxide of Iron.
Sal Ammoniac	Muriate of Ammonia.
Salt of Tartar	Carbonate of Potash.
Slaked Lime	Hydrate of Calcium.
Soda	Oxide of Sodium.
Smelling Salts	Carbonate of Ammonia.
Sorrel Salts	Oxalic acid.

Spirits of Hartshorn	Ammonia.
Spirit of Salt	Hydrochloric or Muriatic Acid.
Stucco or Plaster of Paris	Sulphate of Lime.
Sugar acid	Oxalic acid.
Sugar of lead	Acetate of Lead.
Verdigris	Basic Acetate of Copper
Vermillion	Sulphide of Mercury.
Vinegar	Acetic Acid (dilute).
Volatile Alkali	Ammonia.
Water	Oxide of Hydrogen.
White Precipitate	Ammoniated Mercury.
White Vitriol	Sulphate of Zinc.

POISONS.

In prescribing a medicine, never exceed the maximum medical dose.

Name of Poison.	Maxim' Medical Dose.	Recorded Fatal Dose.
Acetanilide	3 grains.	120 grains
Acid, Arsenious	1/15 grains.	2, grains.
,, Boric	15 grains	Variable amount
,, Carbolic	3 grains.	60 grains.
,, Hydrochloric		1 fl drachm
,, Hydrochloric diluted	20 minims.	..
,, Hydrocyanic, diluted	6 minims	30 minims.
,, Nitric	..	2 fl drachms.
,, Nitric diluted	20 minims.	..
,, Oxalic	..	60 to 180 grains.
,, Sulphuric	.	1 fl drachm
,, Sulphuric diluted	20 minims	..
Aconite Root	.	60 grains
,, Green extract of	1 grain	2 grain.
,, Tincture of	15 minims.	1 fl. drachm
Aconitine	..	1/30 to 1/15 grain
Alcohol	..	3 to 5 fl drachm
Ammonia, Strong Solution of	..	1 fl drachm
Aniline	..	4 Fl drachms.
Antimony, Tartarated	1—8 grains as a diaphoretic 2 grains as an emetic.	5 to 15 grains
Atropine and its Salts	1/100 grain	½ to 2 grains.
Barium Salts	..	100 grains
Belladonna, Liquid Extract of	..	1 fl. drachm.
,, Liniment of	..	1 fl. drachm.
,, Berries	..	14 berries
Bismuth Salts	20 grains	..
,, oxynitrate	20 grains	120 grains
Bromine	..	2 minims
Brucine	.	6 grains
Camphor	1—3 grains	1 ounce
Carbon Bisulphide	..	4 fl . drachms
,, Monoxide	..	1 P c is dangerous.
Chloral Hydrate	20 grains	30 grains
Chloroform	5 minims	4 fl. drachms.
Cocaine	½ grain.	1 to 2 grains.
Codeine	2 grains	4½ grains
Colchicum Corn	5 grains	48 grains
,, extract of	1 grain.	
,, wine of	30 minims.	3½ fl drachms.
,, seeds	..	60 grains.
Conine	..	1 drop
Copper oxyacetate (verdigris)	.	½ ounce , daily dose of 3½ grains

Name of Poison	Maxim. Medical Dose.	Recorded Fatal Dose
Croton oil	1 minim.	2½ fl drachms
Digitalin	..	¼ to ½ grain
Digitalis leaves	2 grains	38 grains
,, Infusion of	4 fl drachms	..
,, Tincture of	15 minims	9 fl drachms
Ergot	½—2 fl dr	1 ounce.
Foxglove, See Digitalis		
Ferric chloride, Tincture of	15 minims	1½ fl ounces.
Gelsemium, Liquid Extract of	.	3 fl drachms.
,, Tincture of	15 minims	4 fl drachms
Hyoscoyamus, Tincture of	1 fl drachm	4 fl drachms.
Hyoscine Hydrobromide	1/100 grain	1—8 grains
Iodine		1½ grains
Iodine, Tincture of	5 minims	1 fl drachm
Lead Acetate	..	1— to 2 ounces.
,, Carbonate	..	1 to 2 ounces.
Lobelia Herb	..	60 grains.
Magnesium Sulphate	½ ounce in one dose ¼ ounce for repeated doses.	1 to 4 fl ounces
Mercuric chloride (corrosive sublimate)	1—16 grains.	2 to 5 grains.
Mercuric Oxysulphate (Turpeth mineral)	..	40 grains.
Mercurous chloride (calomel)	5 grains.	6 grains
Mercury Ammoniated		35 grains.
Morphine and its Salts	½ grains	1 grain.
Nicotine	.	1 to 3 drops.
Nitrobenzene		20 minims.
Nitroglycerine	1—50 grains	1 ounce
Nux Vomica	4 grains.	40 grains.
Oil of Almonds, Essential	..	3 0 minims
Opium	2 grains	4 grains
Opium, Tincture of	15 minims for repeated doses. 30 minims for one dose.	2 fl. drachms.
Phenol, (See Acid Carbolic.)		
Phosphorus	1/20 grain	1—8 to 2 grains.
Potassium Bichromate	1—5 grain	120 grains.
,, chlorate	15 grains.	1½ ounces.
,, Cyanide	..	5 grains.
,, Hydroxide	..	40 grains.
,, Hydroxide, Solution of	30 minims.	..
,, Iodide	20 grains.	5 grains in 'iodism'
,, Nitrate	20 grains.	120 grains
Salol	15 grains.	15 grains.
Silver Nitrate	½ grain.	50 grains.
Stramonium Seeds	1 grain	10 seeds
,, Extract of	½ grain	8 grains.
Strychnine and its Salts	1/15 grains	½ to 2 grains.
Sulphonal	30 grains	1 ounce.
Tobacco	5 grains as an emetic	6 grains.
Turpentine	10 minims ½ fl ounces as anthelmintic	6 fl ounces.
Verdigris (See Copper)		
Zinc Chloride	.	6 grains.
,, Sulphate	2 grains as a tonic. 30 grains as an emetic.	1½ ounces.

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ADDRESSES TO GET RAW MATERIALS FROM.

Alkalies.—Like caustic soda, potash, washing soda, potassium alum, etc. Imperial Chemical Industries Ltd., 18, Strand Road, Calcutta. or branches in chief towns.

Bottle Merchants.—1. Radha Bazar Bottle Stores, 16, Radha Bazar Lane, Calcutta or branches in chief towns.

2. Oriental Import & Export Agency, 52, Shrikrishen Nivas, New Silk Bazar, Kalbadevi Road, Bombay.

Chemical Dealers.—Bombay, 1. Oriental Imports and Export Agency, 52, Shrikishen Nivas, New Silk Bazar, Kalbadevi Road, (Light and Heavy Chemicals).

2. Overseas Chemical and Trading Co., Jan Mansion, Sir Pherozshah Mehta Road, Fort.

3. Standard Chemical Works, 13, Ananwati, 1st Floor, Bombay, 2.

Calcutta. 1. Allied Agency, 16, Bonfields' Lane.
2. Central Supply Agency, 2, Church Lane.
3. Hindusthan Industries Co., 18, Mango Lane.
4. Calcutta Industrial & Minerals Co. Ltd., 38-C, Ramdhore Mitter Lane.

5. S. K. Sen & Co., 13, Kailas, Kaviraj Lane, P.O. Beadon Street.

Creosate Oil (Light) :—Shalimar Tar Products Ltd., Jharia.

Fancy Ready Made Labels.—1 Arorbans Press, Anarkali, Lahore.

2. N. M. Parekh & Co., Mangaldas Bldg., 1, Princess Street, Bombay.

Glass Manufacturers.—1. The United Provinces Glass Works Ltd., Bajoi (E. I. R.)

2. All India Glass Works, Nagina, U. P.

3. Ganga Glass Works, Ltd., P. O. Balawali, Bijnor, U. P.

4. Upper India Glass Works, Ltd., Ambala City.

Machinery Dealers—1, Bombay Industrial Engineering Co., Ltd., Apollo Street, Fort, Bombay, 2.

2. P. N. Mehta & Co., 324, Hornby Road, Fort, Bombay.

Calcutta.—1. Balmer Lawrie & Co., Ltd., 103, Clive Street; (also Ballard Estate, Bombay.)

2. Machinery Supplying Agency, 40, Strand Road.

3. J. E. Thomson & Co., Ltd., 9, Esplanade Street.

4. Small Machineries, Manufacturing & Co., 22, R. G. Car Road, Shambazar.

Oils.—*Cocoanut, castor, linseed and groundnut*—The Tata Mills Co., Ltd., 24, Bruce Street, Fort, Bombay.

Perfumery Raw Materials.—1. B. E. Patel & Co., 143, Princess Street, Bombay, 2.

2. Perfumery Ingredients Co., 31, Mangaldas Road Market, Bombay.

Rosin.—1. The Indian Turpentine and Rosin Co., Ltd., P.O., Clutterbuckganj), Bareilly.

Snow or **Cream** (Ready made bases) :—Industrial Chemistry Manufacturing Department, Benares Hindu University, Benares.

Tin Printing and Tin Containers :—Bengal Tin Box Manufacturing Co., Ltd., Jadu Mitra Lane, Calcutta.

Waxes, Mineral Oils :—Burma Shell Oil Storage and Distributing Co. of India Ltd., Karachi.

PART IV

TECHNO-CHEMICAL DIRECTORY

AND

GLOSSARY OF INDIGENOUS DRUGS.

For classification of medicines according to their effects and for popular names of medicines see Part III. For equivalents of Indigenous Drugs in English, see part V.

B. means Botanical name.

Abrasives.—Substances used for producing wear by friction, *e.g.*, emery, sand, pumice powder, kieselguhr, tripoli, whetstone. Artificial abrassives, such as carborundum and artificial corundum have now almost entirely taken the place of the natural abrasives.

Abrus-Precatorius.—*Cheshma-i-Kharoos; Chungchi; Gunja.*

Acacia. Genus of shrubs and trees of the subfamily Mimosæ, numbering about 450 kinds, cheifly Australian and Polynesian species. They have compound pinnate leaves or flattened leaf-stalks, and clusters of generally yellow flowers. Some species produce valuable gums like gum arabic, catechu, wattle-bark, and valuable timber. Vernacular equivalents are *babla, babul, khair, phulahi, pahari kikar, naga-tumma.*

Acacia gum.—See Gum Arabic.

Acanthum Hirtburn-*Utangan.*—*Qareez.*

Acarus Calamus.—*Bach.*

Accessory.—Something added to the principal design, as the subordinate parts and objects in a picture, the embellishments of sculptured architecture, &c. Also Good adjuncts.

Acetanalid.—Antifebrine, acetyl-hexylamine.

Acetal.—A colourless liquid produced by the slow oxidation of alcohol under influence of finely-divided platinum, or chlorine.

Acetamide.—A white crystalline solid, prepared by the action of ethyl acetate on ammonia, or by heating ammonium acetate.

Acetanilide.—or antifebrin, acetyl-hexylamine, produced by the inter-action of glacial acetic acid and aniline; is antiphlogistic, a cure for neuralgia, and the basis of many headache powders.

Acetate of Aluminium.—So extensively used by dyers and calico printers as a mordant for a great

variety of colours. About 3 lb. of alum are dissolved in 8 gallons of water, and $1\frac{1}{2}$ lb. of sugar of lead stirred in it. A copious formation of sulphate of lead subsides, and the clear liquid is a solution of the acetate of alumina.

Acetate of Calcium.—Formed by the action of acetic acid or vinegar on lime. When crude wood vinegar (pyroligenous liquor) is distilled to separate the acetic acid, methy alcohol hot, and tarry matter by placing it in a vessel and boiling it by means of a steam coil, the distillate passes in succession into two boilers, each containing milk of lime. The acetic acid is here fixed by the formation of calcium acetate while the methyl alcohol, passing on, is fractioned and condensed in a shell.

Acetate of Copper, or **Crystallized Verdigris.**—Dissolve common verdigris in acetic acid, and evaporate till a pellicle forms on the surface of the solution ; and set aside to crystallize.

Di-Acetate of Copper.—or **Common verdigris** is prepared by exposing sheets of copper to the action of acetic acid, or its fumes. In France it is made by the acid produced by the fermentation of grape stalks, husks &c.

Acetate of Lead.—Sugar of Lead is much used as a drier by the painter, and in various operations connected with dyeing and calico printing. It is made by exposing plates of lead to the fumes of vinegar, or pyroligenous acid. The white powder thus produced is dissolved in excess of acid, and crystallized. It may also be made from litharge, or from the carbonate of lead, (the common white lead) by dissolving either of them in acetic acid.

Acetate of Lime.—Same as Acetate of Calcium.

Acetate of Manganese.—Is prepared for the use of calico printers by mixing sulphate of manganese with acetate of lime. It forms transparent, pale red rhombodied tables, soluble in water and alcohol.

Acetate of Nickel. Formed by the action of acetic acid on nickel.

Acetate of Peroxide of Iron.—May be obtained by |digesting turnings and clippings of iron in acetic

acid, or by mixing acetate of lead with sulphate of iron. It forms a deep reddish brown solution not capable of crystallization. It is used by dyers and calico printers.

Acetates.—Neutral salts, composed of acetic acid, and an alkali, or metal. The acetates are, with the exception of two or three, soluble in water, decomposed by heat, and by sulphuric acid, and often, when in solution, by exposure to the air. The chief acetates used in the arts are those of manganese, iron, copper, lead, and aluminium.

Acetic Acid.—A colourless pungent liquid, prepared by the oxidation of alcohol or by the destructive distillation of wood. Freezing Point, 16·70° C. (glacial acetic acid). It is commonly known as *sirke ka tezab*. Vinegar is impure dilute acetic acid. The salts are known as acetates; potassium and lead acetates are used in medicine. A by-product in the manufacture of acetic acid from wood spirit is acetone. For a detailed article, See Part I, p. 146 and pp. 343-345.

Acetic Ether.—Produced by distilling sodium acetate, 60 parts, crude sulphuric acid 42, with spirit of wine, 34; and separating the ether by a solution of pot. acetate in water and rectifying over 1/5 part of magnesia; used in medicine and to improve the taste of wine.

Acetometer.—An instrument for ascertaining the strength or specific gravity of acids. It consists of a globe of about 3 inches diameter, having a little ball beneath, and a graduated stem above; the upper part of the stem being furnished with a cup to hold the requisite weights. It differs in no respects from the hydrometer, except in the material of which it is made, and in the method of graduation.

Acetone, Pyro-acetic Spirit.—or dimethyl ketone, a colourless volatile liquid, B. P. 56·5° C. Prepared as a by-product in the destructive distillation of wood, and also by heating dry calcium acetate *i.e.*, its double distillation. It is employed as a cheap solvent for the gums and resins and in the manufacture of chloroform and sulphonal. Large volumes are used in the manufacture of cordite; the Great War required 150 tons daily. It can also be manufactured by fermenting

maize with suitable bacteria. The diabetic patients generally pass this acid with their urine. In India it can be produced from the fermentation of the flowers of *mowra*. See also Acetic Acid.

Acetous.—Like or belonging to vinegar.

Acetylene.—A colourless inflammable gas, having a faint ethereal odour. It is burnt to produce a dazzling white light by the action of water on calcium carbide. Liquid or solid acetylene is a high explosive, generating a pressure up to 1,00,000 lb. per square inch.

Acidmetry.—The measurement of the amount of acid present in a given substance. It may be obtained by means of specific gravity, if no other substance is present in the solution, or by noting down the weight of carbon dioxide liberated by the addition of a carbonate, or by finding out the quantity of a salt precipitated.

Acid of Sugar.—The popular name given to oxalic acid.

Acme powder.—An explosive mixture, produced by the interaction of picric acid, potassium chlorate, potassium nitrate, and tar.

Action, Chemical.—The effect produced by one body on another so that one or both of them are altered in their properties by the union or disunion. Thus an acid and an alkali have a chemical action upon each other, because they unite and form a salt, which is neither acidic nor alkaline.

Acids.—An extensive class of chemical substances; the properties of which are to combine in certain proportions with the alkalies in solution and with most of the metallic oxydes, forming by such union neutral salts. They redden vegetable blue colours, and have mostly a sour taste. Some are derived from minerals, others from vegetables, still others from animals. Acids arise nearly in all instances from the union of their bases with oxygen; the greater or less relative proportion of which regulates the peculiar properties of the acid. Such as are of the least degree of oxidation; that is, such as have but a small proportion of oxygen, end in—ous. Those containing a large quantity end in—ic

as sulphurous and sulphuric, both consist of sulphur and oxygen; but the sulphurous, acids with the same quantity of sulphur, contains 2 proportions of oxygen, sulphuric 3 proportions. A diminution of oxygen in either case forms a hypo-acid, and hypo-sulphurous acid consists of 2 parts sulphur and 2 oxygen; hypo-sulphuric acid of 2 parts sulphur and 5 oxygen. A few acids derive their acid properties from chlorine, and not from oxygen as muriatic, or as it is now called, hydro-chloric acid. There are not above 20 acids used in the arts, though more than 220 are described in "Brande's Chemistry." Different acids will be found under their respective names.

Acids, Artificial.—Such acids are so called when formed by the mixture of other acids. Thus, nitro-chloric acid is formed by mixing together the nitric and chloric acids. They are mostly a union of nitric acid with some vegetable principle, and formed by boiling that principle or ingredient in strong nitric acid.

Acids, Fatty.—Such acids as are formed by reducing an oleaginous or fatty body to soap by means of alkali; then by adding alcohol a neutral salt is separated, composed of the alkali used, and the fatty acid. Of this nature, and thus formed, are the stearic, margaric, oleic, phocenic, butyric acids, &c.

Acidifiable.—Capable of being converted into an acid. Such substances are called radicals, or bases.

Aconite.—Woolfsbane Ver. *Mitha telia, Atees, Atibisha.* Genus of plants of the buttercup family, having tall stems and blue or yellow flowers, there being no less than 60 species. Aconitum napellus, woolsfsbane or monks' hood is largely employed in homœopathy, it being its backbone. The roots of black colour are poisonous, containing an alkaloid called aconitine, used in medicine, to relieve neuralgic pains, and internally in small doses to steady and slow the action of heart in fevers, in this respect its action being opposite to that of digitalis. *Bachnag.*

Adamant.—*Almas.*

Adhatoda Vasica.—Aroosa.

Edgew Angelica Caluca.—Angelica Chohore.

Adhesives.—Substances which can hold together particles of different bodies. They are of gummy or gelatinous nature, the chief sources being gum arabic. dextrine, glue, casein, rubber, the juice of ripe lasooras Milk casein dissolved in an alkali is much superior to gelatine or glue as it can be applied cold. The sulphite cellulose, the liquor in the manufacture of paper from wood, now supplies the base of most of the modern adhesives.

Adhesive Slate.—A soft, massive yellowish grey slate which splits easily, and adheres to the tongue whence its name. It is found near Paris in the gypsum beds.

Adrenalin.—Active principle of the supra-renal gland, a specific Harmone. When injected it constricts blood vessels and increases greatly the force of the blood and frequency of the heart-beat. Arrests bleeding.

Adulteration.—The debasement of any article of produce or manufacture, by the introduction of inferior materials.

Aerated Water.—Water impregnated with carbonic or some other gas. Water of this kind is commonly sold as soda water, though improperly so called. Many mineral springs are impregnated with different gases, that at Harrogate contains sulphuretted hydrogen. Water may be made to absorb numerous gases.

Aeration.—Process of charging with the air *e.g.*, venous blood and plants. In industry it is charging of water, syrup or other liquids with carbon dioxide or other gases.

Aerograph.—Appliance worked by compressed air for creating fine stipple. Used for retouching photoes before half-tone reproduction.

Aether.—A thin subtle fluid supposed to fill all space within, below and beyond the limit of our atmosphere. Its existence is purely hypothetical, yet was maintained by most of the ancient philosophers and by many of the moderns, among whom was Sir

Isaac Newton. Some imagine it to be identical with the electric fluid. (See Ether). Aether or Akash was and is looked upon as a fundamental element of the universe by the ancient Sanskrit scholars.

Aethiops Mineral.—Mercury triturated with sulphur till it assumes a black colour.

Aetna Salt.—An impure sal amoniac of Mount Aetna and other volcanoes.

Affinity.—A tendency of two bodies to unite chemically with each other, as an acid and an alkali unite and form a neutral salt, because they have an affinity for each other. Oil and water do not unite because they have no affinity.

Agar-agar.—Or china grass, a gelatinous sea-weed from East-Indian seas; now a vegetable isinglass prepared from various seaweeds in Japan; used for veneering wood and sizing silk.

Agate.—A silicious mineral, being variegated chalcedony, occurring in rounded nodules, found from the cavities in the igneous rocks. The various tints, red, brown, etc., are due to the presence of iron or other oxides. On account of the high polish that it can take, agate is used in ornaments, and for its hardness in making laboratory appliances, as mortars, pestles, and knife-edges of delicate balances. Seals are also made of agate. *Aqeeq*.

Air Pistol, or Cannon, Electrical.—Consists of a tube of brass, in the end or side of which a glass or ivory tube is inserted, with a bent wire passing through the tube, so that when a spark is taken on the wire from an electrical machine, and the fluids may pass in a spark from the point of the wire which is within the tube, if, therefore, it be filled with hydrogen, and corked up, a spark will inflame the hydrogen, and an explosion ensue.

Ajax powder.—An explosive consisting of $37\frac{1}{2}\%$ potassium perchlorate, 25% ammonium oxalate, $22\frac{1}{2}\%$ nitro-glycerine, $10\frac{1}{2}\%$ wood-meal, $3\frac{1}{2}\%$ trinitrotuluene, and $\frac{3}{4}\%$ collodion cotton.

Ajowan Seed.—Carum Copticum, Benth Jowan.

Alabaster.—Is of two kinds one sulphate of lime, or gypsum. the other a carbonate of lime, analogous

to marble, but softer in texture. The oriental alabaster, which is of this kind, is the most valuable, and of extremely varied and beautiful colours. It is used chiefly for the manufacture of bell handles, time piece cases, &c. The Italian alabaster is also of various colours, but the one which is pure white, and of marble-like appearance, is preferred. It is cut into innumerable ornaments, and small pieces of statutary for the decoration of houses, &c.

Alangium Lamaracku, *Ankot, Ankol Albizzia Lebboc, Siris, siras, Pb.-sareen; Ar. zarkarya.*

Albumin.—Complex compounds, containing carbon, hydrogen, nitrogen, oxygen, and sulphur formed in plants, especially in seeds. The white of an egg is a well known albumin. They do not diffuse through animal or vegetable membranes; coagulate on being boiled with water or on being treated with certain acids. They show a weakly acid and weakly basic reaction. They form the sub-group of proteins.

Alchemy.—The science of chemistry, as it was applied in former times to the attempted transmutation of the baser metals into gold; the discovery of an elixir vitex, or universal medicine; a universal solvent; and other visionary substances. The first of these objects, was the principal one aimed at, and this by a powder, called philosopher's stone, which, mixed with any metal, and assisted by fire, was to change that metal into gold. The endeavour to discover this powder occupied the attention, exhausted the fortunes, and destroyed the health of hundreds of enthusiasts, during the middle ages, especially from the period of King Edward I to that of Charles II, and even after that period, and in India even till recently.

Alcohol.—*Sat-i-sharab.*

Alcohol of Sulphur—The bi-sul-phuret of carbon.

Alcoholometry.—The determination of alcohol in a liquid, estimated by Sike's hydrometre.

Aldehydes.—Organic compounds, obtained from alcohols by oxidation, and producing acids when oxidised themselves, *e.g.*, methyl-alcohol produces formaldehyde

and this may be oxidised to formic acid. Another name for acetaldehyde.

Ale.—Same as beer.

Alizarin.—Dyestuff produced from the Indian Majith, a vegetable principle extracted from the red colouring matter of the madder plant, by subliming the precipitate which water throws down from its alcoholic solution; now synthetically from anthracene; crystallises in red prisms; melting point 290°; produces turkey-red, purpurin and other dyes with different mordants.

Alkali.—Ver. *Khar*, an acrid, caustic chemical which forms soap with fat and oil, combines with acid to form a neutral salt; turns most vegetable blue colours into green, and yellow to brown; and red litmus paper blue. Examples, soda, potash, hydrates of sodium, potassium, calcium, and in wider sense the carbonates of the above-named metals.

Alkalimeter.—An instrument to ascertain the strength of an alkali. It consists of a graduated tube, into which a certain quantity of dilute sulphuric acid, of a known strength, is poured. The quantity of the alkali under examination found necessary to neutralize the acid will indicate its relative strength.

Alkalimetry.—The determination or the quantity of an alkali in a substance by neutralising it with an acid.

Alkaline Earths. Such earths as unite and form neutral salts with the acids. They are lime, magnesia, alumina, lithia, baryta, and strontia.

Alkaloid.—Any vegetable principle which has alkaline properties. The alkaloids are much used in medicine, but not in the arts. The chief are morphia, quinine, strychnine, brucine, veratrine, conine, atropine, delphine, emetine, and numerous others. The general method of procuring them is to make a solution of the vegetable, concentrate this a little by boiling, add ammonia till it is a little in excess. A precipitate will fall down; digest this in proof spirit to take away the colouring matter. Then the precipitate left is dissolved in boiling alcohol as strong as possible to be procured, and set aside to crystallize. The alkaloids are chiefly made in France, because of the expense of alcohol, and owing to exhorbitant and killing duty on all spiritous liquors in India.

Alkanet.—(*Ratanjot*). The name of a South European plant, the root of which is used in staining wax, lip and other salves, perfumed oils, mahogany and marble. Its colour is contained chiefly in the bark, is of a reddish brown, and is easily extracted by spirits of wine, and by oils, wax, and other unctuous substances. The roots are chiefly imported from France where the best is produced.

Alloy.—A combination of two or more metals; also used to indicate any inferior metal, which may be mixed with gold and silver. If mercury be one of the combining metals, the mixture is an amalgam, (q.v.) not an alloy. The chief alloys are brass tombec, pinchbeck, prince's metal, bell metal, type metal, gun metal, solders, fusible alloys, &c.

Allspice.—*Shahjira*, jamaica pepper; dried pea-like fruits of pimento : supposed to contain flavour of nutmeg, cloves and cinnamon; *seetal cheeni, kababah, sard cheeni,* cultivated in Jamaica and Mexico; used for flavouring confectionery, seasoning and in medicine; fruits contain a volatile oil; wood is used for manufacturing walking sticks.

Almond.—The kernel of the fruit of the amygealus communis and amygdalus amara, or sweet and bitter almond tree. In medicine, triturated with water, almonds form an emulsion. The bland oil extracted from them by pressure is valuable in the arts, particularly for the use of the perfumer, while the chemist extracts by boiling and distillation the prussic or hydrocyanic acid.

Almonds; *badam.*—The sweet variety is used in confectionery and from the bitter variety the essential oil is extracted.

Alocasia Indica, Schott.—*Man Kachu.*

Aloes.—*Elwa, sibar, musabbar, kala suhaga,* genus of African plant, cultivated as ornamental plants. Used as purgative and as emmenagogue.

Alœswood.—Or eagle wood, resinous and fragrant heart-wood; used as perfume in the East. *Agar.*

Aloetic Acid.—A name given by M. Liebeg to the bitter principle of alœs, procured by means of nitric

acid-spec. grav. 1–25. It precipitates the salts of baryta, lead, and protoxide of iron, of a purple colour, and forms a purple salt with potash. It is the same as carbazotic acid.

Althae.—*Khatmi.*

Alum.—*Phatkari,* aluminium sulphate, a double sulphate of aluminium and potassium or ammonium known as potash alum or ammonium alum, there being no difference in their apperance or properties; used as mordant in dyeing, in the manufacture of paper and leather works, and as astringent in medicine; obtained from alum schist, bauxite, and cryolite.

Alum cake.—Same as powdered aluminium sulphate.

Alum chrome.—Or double sulphate of potassium and chromium, also known as potassium chromium alum, used in dyeing and tanning.

Alumina.—Oxide of aluminium, Corundum *Kurund,* (q.v.), An earth which forms the chief constituent in clay or argillaceous soil. It is white, tasteless, insoluble in water, soluble in acids, and caustic alkalies; has a powerful affinity for grease, and contracts equably by heat. The abundance of alumina in pipe clay, common clay, and fuller's earth, render these earths so valuable in the arts. The sapphire and ruby are pure alumina.

Aluminium bronze.—An alloy containing 90% copper and 10% aluminium.

Aluminium chloride.—Is prepared by heating aluminium or a mixture of alumina and carbon in chlorine.

Alumino-ferric.—A mixture of sulphates of aluminium and soda.

Alumstone.—The native variety of alum.

Alumdum.—Fused alumina.

Amadou.—German tinder, is made from the spongy fungus, called boletus igniarius, by boiling it, beating afterwards with a mallet, and soaking in a solution of saltpetre. When dried it forms an excellent tinder.

Amalgam.—An alloy of some metal with mercury, being solid or liquid according to the proportion of mercury; used for silvering mirrors and for tooth cements, in extracting gold and silver from ores; for applying on the rubbers of frictional electrical machines. For Amalgam for Mirrors and for Amalgam for Electrical machines. See Part I, P. 49 and P. 50.

Amalgam of Gold.—Heat until it fumes, 2 ounces of mercury, then add one ounce of gold (or silver). Used for water gilding.

Amalgam for Silvering Glass Globes.—Melt 1 part of tin, 1 of lead, 1 of bismuth, and 2 of mercury. When cold, mix with the white of an egg.

Amber.—*Kehrba,* sometimes loosely it means Ambergis, a fossil resin; exudation of conifers; colour clear, brownish-yellow; usually transparent, brittle, with hardness 2 to $2\frac{1}{2}$, burns readily; on being rubbed electrified negatively; genuine amber obtained from shores of Eastern Prussia, Schleswig-Holstein, Burma, and in certain alluvial soils. Chiefly used as mouth-pieces for pipes, for beads, and dissolved in alcohol as bases for varnishes. Much of the commercial amber is artificial.

Ambergis.—*Musk ambar; ambar-i-ashbab,* a highly fragrant substance of grey or black mottled colour morbid intestinal secretion of whale, found floating in small pieces in tropical seas, used in making perfumes and in medicine.

American Wormseed.—B. Chenopodium Ambrosoides.

Amethyst.—*Sang-i-martees,* clear violet or purple variety of quartz, found in cavities of granite rocks and mineral veins, used as gem-stone.

Amide powder.—An explosive consisting of 40% potassium nitrate; 38% ammonium nitrate; and 22% charcoal.

Amidogene.—Blasting explosive, consisting of potassium nitrate 73%; bran 8%; charcoal $8\frac{2}{3}$%; sulphur 10%; and magnesium sulphate $1\frac{2}{3}$%.

Ammonia Liquid.—Is prepared by heating slaked lime with ammonium chloride (*naushadar*) in a retort.

The gas produced is dissolved in water. Strongest solution contains 32% of ammonia by wt. sp ; gr. 0·880. Colourless, pungent, and strongly alkaline.

Ammoniacal Liquor.—A liquid which passes off from the retort when coils are submitted to distillation, as in the process of the gas manufacture. One ton of coals will produce from 17 to 20 gallons. It consists chiefly of the carbonate and the sulphate of ammonia, of uncertain degrees of purity.

Ammoniacum.—Gum resin from Paris and Punjab plant called Dorema ammoniacum, used as expectorant and antispasmodic in cases of chronic bronchitis, also externally as reducing plaster.

Ammonium chloride.—Salammoniac. *Naushadar*

Ammonium flouride.—Is prepared by saturating hydroflouric acid with ammonia.

Ammonium muriate.—Ammonium Chloride.

Ammonium sulphate.—Is obtained by neutralising ammonia with Sulphuric Acid.

Amorphous.—Having no definite structural form as opposed to crystalline.

Amylic Acid.—Procured by distilling starch, mixed with equal parts of black oxide of manganese, and moistened with water. It turns sour, reddens vegetable blues, and with bases forms neutral salts, very soluble, and deliquescent.

Amylnitrate.—An amber coloured oily fluid with a pleasant odour. B. P. 95°C. Breathing of the vapour causes flushes of the face and palpitation of the heart. Used in relieving angina pectoris and in reducing high blood pressure.

Amyranthes-spin.—*Chulai.*

Anchovy.—*Chhoti samundri macchli.*

Andropogon Muricat, *Azkharkhas.*

Anemone.—Argmoni ; *gul-i-hawa.*

Anhydrous.—Deprived of water ; amorphous ; calcined.

Aniline.—(Amidobenzine, Phenylamine), a colourless, poisonous, oily liquid having a bad odour. Melting point, 8°C. boiling point, 183°C.; Manufactured from

the benzene obtained from coal tar: resinifies in air; forms salts with mineral acids; used in dyeing industry and in medicine: methyl violet, methylene blue, being examples.

Aniline salt.—Aniline chloride, a salt obtained by treating aniline with hydrochloric acid.

Animal charcoal.—Used in refining sugar, is obtained by burning animal bones, for which see the Industrial Encyclopædia, See also Bone Black. Part I. P. 31.

Animal glycerine.—Neatsfoots oil, *Animal oil,* bone oil; *Rogan-i-Ustakhwan*; *hasthitel.*

Aniseed.—*Saunf*; *badyan,* is cultivated widely in the Punjab, in Mediterranean region, in S. Russia, and in Germany. It is used as spice and in making confectionery, but chiefly for expressing oil which is used in medicine as stomachic, in flavouring liquors etc. The residue is used as cattle food in Germany.

Annatto.—An orange red colouring matter, obtained from the seeds of a small tree, bixa prellana, growing in E. and W. Indian islands; Ver. *latkan, jarat kisri;* used in dyeing silk, cotton and wool; also used to colour butter, cheese, varnishes and liquors. Spanish annatto is imported from Brazil.

Annealing.—A process by which glass and also various metallic bodies are changed from a state of brittleness to one of toughness. This is accomplished by keeping them for a length of time at a very low heat, and after-wards cooling them very slowly. See P. 110.

Anode.—The positive pole of a battery.

Anodynes.—Drugs calculated to relieve pain by acting as sedatives on nerves or nerve centres: *e.g.* opium, *hashish,* morphine, chloral hydrate, antipyrin, antifebrin, as internal, and aconite, belladona and cocaine as local. All of them are dangerous.

Antacids.—Medicines calculated to counteract acidity used in dyspepsia and gout; *e.g.*, basic compounds of sodium, potassium, ammonium, magnesium, lithium, and calcium.

Anthracene.—A white fluorescent, crystalline soild: melting point, 213°; bioling point, 351°C.; obtained from coal tar; used in the manufacture of alizarin and other allied dyestuffs.

Anthracite.—Dense, hard, glossy black coal; containing 95% carbon and very little ash. It exhibits the most mineralized state of carbon, graphite being exception. It is much used in reduction of iron and as steam coal.

Antichlors.—Substances which combine with chlorine; soluble in water and harmless to paper or cloth which has been bleached with chlorine; *e.g.*, hyposulphite and sulphite of soda.

Anticorrosives.—Substances employed to prevent rusting, by dipping water pipes into hot tarry composition or coating with magnetic oxide, galvanizing etc.

Antidote.—A medicine that can counteract a poison, by neutralising it chemically or by eliminating it physically, or by acting as a sedative, as adrenalin.

Antifebrin.—See Acetanilide.

Antimonic Acid—Is a peroxide of antimony in form of a white hydrate procured by treating antimony with strong nitric acid or nitro-hydrochloric acid, concentrating by heat, and pouring the solution into water; with alkalies it forms antimo-nitrates.

Antimony.—*Surmah*, a bluish white, lustrous, brittle, crystalline metallic element. Melting point, 630°; boiling point, 1300°C. On account of expanding when solidifying, it is used in casting, especially in type-foundries, the type-metal containing lead, antimony and tin. Britannia metal consists of antimony, tin, and a small proportion of copper. Alloyed with lead used for sharpnel bullets. As bad a poison as arsenic. Red antimony sulphide used in vulcanising rubber and on safety matches: the tetraoxide to render enamels opaque.

Antimony chloride.—Formed by the action of chlorine on antimony.

Antimony vermillion.—Popular name for antimony oxysulphide.

Antimony white.—Same as antimonious oxide.

Antimony yellow.—Popular name for basic lead antimoniate.

Antipyretics.—Substances which reduce body temperature in fever ; antifebrin ; vinegar and rose water.

Antipyrin.—Or phenazone, a white, crystalline, bitter medicine having no odour, used in medicine to reduce temperature, and in relieving pain. Very depressent and so superseded by other medicines.

Antiseptics.—Chemicals which destroy, prevent or arrest the growth of bacteria, counteracting putrefaction or fermentation in wounds, *e.g.*, boracic acid, carbolic acid, powdered charcoal, creasote, nitric acid, and chloride of lime.

Antispasmodics.—Medicines which relieve or prevent muscular spasm and the attendant pain : *e.g.* anæsthetics, narcotics and sedatives.

Aphrodisiacs.—Medicines calculated to excite the sexual passions, *e g.*, cod-liver oil, *makradhwaja* ; phosphorus, saffron, musk ambergis, cantharides ; homeœpathic avena sativa.

Apiculture.—The science of bee-keeping.

Apium invalucreta.—*Ajmod.*

Apricot.—Or *Khurmani*, a yellow coloured fruit; the kernels contain 40 to 45% of an acrid, colourless, fixed oil, almost same in chemical properties as *almond* oil.

Aqua ammonia.—Water saturated with ammonia gas.

Aqua auranti floris.—Distilled water from orange flowers, *santara ka araq.*

Aqua fortis.—The old and still popular name for nitric acid. There are two kinds in ordinary use, one called simply aqua-fortis which is about a quarter the strength of nitric acid and double aqua fortis which is as its name implies double the strength of the common kind. It is used in numerous metallurgical processes, particularly by workers in brass and copper, by whom it is known by the name of pickle. Engravers employ it to etch their copper and steel plates after the lines have been traced through the etching ground. Used in making blocks. Nitro-muriatic acid promotes digestion.

Aqua regia.—See P. 252.

Aquerite.—Compound of mercury and silver.

Aqueous.—Pertaining to, or consisting of water.

Aqua Tinta.—A species of engraving on copper or steel imitating Indian ink drawings. The outlines of the figure are first etched in the usual manner upon a sheet of copper or steel; then a solution of mastic or rosin in spirits of wine is thrown over it; the spirit of wine on evaporating leaves the mastic or rosin in minute specks; acid being poured on the plate, bites in the interstices between the particles of rosin. The lighter parts, when bitten enough are stopped up, one part after another, the requisite effect is produced according to the strength of the solution of rosin. So the specks deposited by the evaporation of the spirit will be larger or smaller, and thus such a coarseness or fineness of grain may be given to the work as may be desired.

Arabic Gum.—A gum which flows naturally from different species of the acacia, the plum tree tribe &c. It is of considerable value for stiffening various fabrics such as bonnets, lace linens &c., and for numerous other purposes in the arts.

Arachis oil.—*Rogan-i-moong, phali*

Archil.—A purple dye for cotton and silk, obtained from lichen.

Araroba Powder—Same as Goa powder, obtained from the trunk of a tree growing in Bahia and Brazil; a powerful irritant, a weak parasiticide; a base for most of the ringworm ointments.

Areca-nut.—betel-nut. *Supari.*

Areometer,—German name for hydrometer.

Argand burner.—A lamp burner through the centre of which the air is enabled to pass, as in the common table lamps, gas burners, &c.

Argillaceous.—Slates that contain more of clay; clay slate as distinguished from mica, whet, polishing, drawing, adhesive or bituminous slate.

Argol.—Crude tartar, a hard crust, of reddish brown colour deposited in wine casks from which cream of tartar and tartaric acid are obtained.

Aristoclochia Indica.—*Zarawind, Ishwarmool.*

Terminalia Arjuna-Bedd.—*Arjan; Kahu.*

Armature.—Revolving part of electro-motor or Dynamo.

Aroma.—A general term for all powerful and pleasant odours, such as the aroma of the rose, the cinnamon, &c.

Aromatic Vinegar.—Acetic acid scented with camphor, oils of cloves, lavender and rosemary.

Arrack.—A spirituous drink obtained by the distillation of fermented sweet liquors, from rice, as also from the juice of palm tree.

Arrowroot.—*Ararot.* The fecula or starch which composes the root of different species of the marants. It grows both in the East and West Indies, Brazil &c. The better samples are used as food, the commoner in many of the textile arts, and in dressing. Potatoe starch has the same properties.

Arsenic.—*Wish, sankhia : samulfar.* Metalloid in nitrogen group; white arsenic or arsenious oxide; occurs native, also combined with metals, as sulphides and pyrites, from which sublimated: colour steel-grey; good conductor of heat and electricity; Sp. Gr. 5.73; sublimes at 45° C.: vapour smells like garlic: used for hardening lead shot. Arsenious oxide mixes with water to produce arsenious acid, of which large volumes are used in making insecticides, in glass manufacture and in sheep dip. Compounds of arsenic useful in curing syphilis.

Arsenic Acid.—A white powder, with acid properties, consisting of 1 part metallic arsenic and 2½ oxygen. Soluble in 6 parts of cold, and 2 of boiling water. Its solution tastes sour and metallic. It may be procured by distilling nitric acid off metallic arsenic.

Arsenical Soap.—A preparation used to anoint the skins of animals during the process of preparing and stuffing them for the museum. The composition of the inventor, M. Becoeur, is as follows :—

Arsenic in powder .. .	2 ounces.
Camphor	5 drams.
White Soap	2 ounces.

Salt of Tartar	.. ..	12 drams.
Powder Lime	.. ..	4 drams.

Arsenious Acid.—White arsenic. White oxide of arsenic is composed of arsenic; tasteless, and violently poisonous. It may be procured by sublimation from the metal.

Arsenio-sulphurets.—Compounds of the arsenical sulphurets with the alkaline sulphurets, divided into arsenio-proto-sulphurets, or such as have the proto-sulphuret of arsenic, realgar (q. v.), in their composition. Arsenio sesqui-sulphurets, containing orpiment, (q.v.) or sesqui-sulphuret of arsenic, and arsenio-persulphate, containing the per-sulphuret of arsenic. All are deadly poisons.

Arsenites.—Componds of arsenious acid and various bases. The chief arsenite used in the arts is Scheele's green, which is an arsenite of copper, procured by precipitation from the sulphate of copper.

Artemisia Indica, *Brizasaph, Afsenteen.*

Artichoke.—*Hathichak*, cultivated as vegetable for edible tubers.

Arum.—*Arvi, Qalqash.*

Arum Campanulet.—*Zameen Qand*

Asafoetida.—*Mushkhani, Heeng,* gum resin from living roots of plants in E. Persia and W. Afghanistan: used for culinary purposes: as cathartic and nerve stimulant and in hysteria. See also Assafœtida.

Asrun.—*Asaroon.*

Asbestos.—A fibrous flexible mineral, indestructible in the fire, of which there are five varieties. *Amianthus*, which occurs in soft, white, long, and silky filaments, from which the ancients made cloth, in which bodies for the funeral pile were wrapped; also, dresses have lately been made of it, for the use of firemen in entering burning houses, &c. *Common asbestos* is inferior to, but resembles the above, except in being less flexible, and twice as heavy. *Mountain*: it resembles leather, when in very thin pieces it is called *mountain paper*. *Mountain cork* or *elastic asbestos* is like the last, but less compact: it swims on water. *Mountain*

wood, ligniform asbestos, differs in no degree from the preceding, except in being harder, of a bronze colour, and having the aspect of wood.

Asetapias-Herbicia ; *Padmakh.*

Asepsis,—Condition of freedom from micro-organisms and their products.

Ash.—The wood of the *fraxinus excelsior*, or ash tree, valuable for its toughness, strength, elasticity, and straight grain, while kept dry for its durability, therefore much used for wheel work, carriages, agricultural implements, and the handles of tools. The young wood is equally valuable with the old.

Ashes.—The incombustible whitish powdery material remaining after the burning of organic matter, and also certain mineral substances. The ashes of vegetable substances are mostly impregnated with alkali ; those produced by the burning of sea-plants being impregnated with soda ; those from terrestrial vegetables with potash, in both instances combined with carbonic acid and much earthy matter. Coals, bitumen, &c. are devoid of these alkalies, but yield ammonia and other products, during their distillation, and leave an earthy slag, which still more burnt changes into an inert grey ash. The ashes of animal remains, particularly those from bones, are totally different in their nature, composed chiefly of phosphoric acid and lime, in the combined state of phosphate of lime.

Asparagin.—A vegetable principle, discovered in the juice of asparagus the mallow, and other plants. When the juice of these is concentrated by evaporation, crystals spontaneously separate. This substance appears to consist of hydrogen, oxygen, carbon, and nitrogen, but contains neither earth nor alkali. It is white, transparent, a slightly nauseous and cool to the taste, and soluble in water.

Asparagus.—*Nagdaman, nagdaun, mooli suphaid.*

Asparagus Racemosa.—*Satawar ; Shaqaqal'misri.*

Asphalt, Jew's pitch, or bitumen : a hard shining pitch like substance : *Khushk luk*. Mineral pitch, the black-coloured bituminous deposits, formed by drying crude petroleum. Lake Trinidad and Dead

Sea provide immense quantities of asphalt. Used for roofing, coating on floors and roads, and as black varnish.

Aspirin.—Acetyl-salicylic acid.

Assa Foetida.—*Heeng.* The inspissated juice of an umbelliferous plant, found in several parts of Asia. It is of a most powerful and foetid scent, and is used in medicine to counteract flatulence, and to improve the taste of boiled pulse. See also Asafoetide.

Assay, or Assaying.—A chemical analysis to ascertain the quantity of gold and silver in a metallic mass. In its more extended meaning it is used for the determination of the quantity of any metal whatsoever, in composition with any other metal, or mineral.

Astringent.—A substance with a rough, austere taste, causing contraction in the organic substances. Their action is due to coagulation of albumin, *e.g.*, alum, wintergreen, tannic acid, ferric chloride, copper sulphate : or due to constriction of blood vessels, *e.g.*, adrenalin.

Atlas Powder.—Explosive of the dynamite variety, made by absorbing nitroglycerine by wood fibre, to which sodium nitrate and magnesium carbonate are added.

Atomic weight.—The density of an element as compared with hydrogen.

Atropine.—An alkoloid freed from belladona : a powerful poison, dilates pupils of eyes : quickens heart's action. The basis of *theatropa belladonna*, or deadly night-shade.

Attar of Roses.—A concrete oil of astnoishing and delightful fragrance made from roses in India and Turkey. To produce one rupee's weight, (not half an ounce), of attar, requires 200,000 full-blown roses. It is, therefore, extravagantly dear, being sold at the English ware-house at £10 for the above weight. The fragrant material sold in England as attar is spermaceti scented with about a thousandth part of attar. See Pomades and Chapter on Perfumery in part 1. P. 209.

Attenuation. A making thin, applied in distillation and brewing. The specific gravity of spirit is diminished at every distillation, because of its im-

purities being removed; it is therefore said to be attenuated. Wine also becomes lighter during fermentation, because of the formation of a vinous spirit, and the separation of carbonic acid gas. In proportion to the perfect fermentation, therefore, the whole mass will become attenuated.

Auriferous.—Bearing gold.

Azure Stone.—See Lapiz Lazuli.

Azurite.—Basic copper carbonate: blue mineral.

Babbit's metal.—An anti-friction alloy made by mixing tin, antimony and copper; extensively employed on U. S. A. and German railways.

Babul.—Acacia arabica, *Mugeel, Kikar*, yields gum arabic and tannin.

Bael Fruit.—*Bel, safar jal; Lilgiri* L. *Aeglemarme los corr.*

Bakelite.—Trade name for an amber-like substance produced in America from phenols and formaldehyde: black plastic and insulating material: great strength: greatly insoluble: resistant to chemicals.

Baking Soda.—Sodium bicarbonate.

Baking Powder: See P. 126.

Balanitis.—*Hingot, Ingudi.*

Balsams.—Resinous substances exuded from certain plants: Verm *balsan, gulmaindi*; Balsam of peru, balsam of tolu, used in perfumery: prepared storax and benzoin used for making skin ointments: also for tinctures and expectorants, Copaiba balsam is used along with sandalwood oil as remedy for gonnorhœa, being the principal constituent of Sandal Midy. Canada balsam is used in making varnishes.

Balsam of life.—*Dec. Alœs Co.*

Balsams.—Vegetable juices, either liquid or concrete, consisting of a substance of a resinous nature, combined often with benzoic acid. They are insoluble in water, but readily dissolve in alcohol and ether. The liquid balsams are copaiva, opobalsam, Peru, styrax, and tolu. The concrete are benzoin (loban) dragon's blood, and storax (*salajeet*).

Balsam of Sulphur.—A solution of sulphur in oil.

Bamboo Pith.—Bamboo *manna ; bansalochan.*

Bansa,.—A plant growing wild on the lower heights of the Himalayas, in C. P. and elsewhere of great therapeutic value in diseases of respiratory organs.

Barilla.—A name given in commerce to the impure soda imported from Spain and the Levant, and from several parts of India. It is made by burning to ashes different sea or land plants and is sold in bazars in hard porous masses, of a speckled brown colour as *sajji, lota sojji.* In the Punjab it is made from *Lahna grass.* But the industry has been killed by the importation of soda ash and caustic soda.

Barium.—Metallic element, belonging to alkaline earths ; shines like silver ; oxidises readily ; reacts with water and alcohol : barium sulphate used in pigments : barium nitrate, in making explosives and in pyrotechnics; barium peroxide, in making hydrogen peroxide : barium sulphide, in making depilatories.

Barium carbonate.—Witherite ; can be obtained by fusing barium sulphate with soda. Basis of many rat poisons like Rat Off," Anti-rat."

Barium sulphide.—A popular chemical used in depilatories. A deadly poisson.

Barium sulphate.—Can be obtained by mixing solutions of barium nitratc or chloride with any sulphate. Unlike barium sulphide not a poison. Used internally before X-raying the stomach.

Barium white.—Barium sulphate. (q. v.)

Barley Pearl.—See Part I.

Baryta,—Barium oxide.

Barytes, Barium sulphate or heavy spar.—An alkaline earthy substance, composed of barium and oxygen : it readily combines with most of the acids. Its sulphate and carbonate are very abundant as minerals in many parts of England and known on account of their weight by the name of "*ponderous spar,*" though this term applies properly to the former only. It is scarcely used in the arts, is insoluble in water, and in alcohol. Sp. Gr. 4·5.

Barytes.—Barium sulphate or heavy spar; colour white, pink or colourless, Sp. G. 4–5; used as permanent "white pigment: as filler for writing paper. Other barium compounds made from this mineral.

Basalt.—A ponderous, massive, black mineral, occurring mostly in immense columnar concretions, in ingeous volcanic rocks of which the celebrated Giant's Causeway, in Ireland, and Fingal's Cave, in the Isle of Staffa, are remarkable examples.

Basaltes.—A black kind of earthenware, formed of basalt ground, mixed with a little borax, or soda, moulded and baked. Its use is well known in black tea pots, milk jugs, etc. It is very hard and durable; resists acids; is capable of taking a high polish; and will bear, without injury, a great degree of heat.

Base.—A rest or support; particularly applied to the bottom of columns and pedestals. In geometry, the lowest part of a figure; or that upon which it is supposed to stand; in perfumery, some vehicle for increasing the weight of costly perfumes, *e.g.*, purified and deodorized petroleum, sandalwood oil, olive oil, sweet oil, vaseline; paraffin, beeswax, *zameen*.

Bases.—Compounds that like alkalies combine with acids to form salts and water. All metallic oxides are bases: all non-metallic oxides form acids: a fundamental principle.

Basil.—Plants of the Tūlsi family; marjoram being a specie: tonic, carminative, used as kitchen herb.

Bassia.—A tree native of India, rich in fat, used for food in India, and for soap and candle-making in Europe. On being purified it makes margarine.

Bassia Abrus; *Chaksu*; an excellent external and internal remedy for eye diseases. It is said if *chaksu* be taken internally in early life, it safeguards eyes and eyesight.

Bassorine.—A constituent part of a species of gum which comes from Bassora or Basra. It is obtained by soaking gum Bassora in a great quantity of cold water, and in removing by a filter all the soluble parts. It is semi-transparent, swells in cold and boiling water, is difficult to pulverize, but very soluble in water slightly acidulated with nitric or muriatic acid.

Bastard Teak.—*Plash, Dhak, Pb. Chhichhra.*

Batatans Paniculata.—*Badari Qand.*

Bath.—In Chemistry, is a vessel filled either with hot sand, or with water, enclosing another vessel which contains a substance to be dried or heated ; of a *water bath* the common glue pot is an example ; a *sand bath* is of the same formation ; it may be considered an iron pan full of sand : put on a fire it will become gradually and equably heated, and acting like a fire, heats whatever is put upon it, and that without danger to the glass vessels, without burning their contents unless the fire is very strongly urged. Baths have often been made of oil, melted lead, tin, etc., and steam has been advantageously been employed to heat various bodies in the same way. Grain is scorched by the bharbhoonjas (grain scorehers) in India over a sand bath.

Bath Metal.—An alloy of 4½ ounces of zinc and 1 lb. of brass.

Bauhiniavar.—*Kachnar.*

Bawachi.—*Buchki, Babchi* L. *Psoralea Corylifolia.*

Bay leaf.—*Barg-i-jauz boa tejpat.*

Bay rum.—Cologne water, an odoriferous cosmetic from Bay Leaves.

Beans.—*Sem ki phali, French Beans etc.*

Beeswax.—Melting point 64°C. *mom.* of paraffin, soluble in chloroform and turpentine.

Beetroot.—*Chaqandar ; pindmool ; salaq.* The source of beetroot sugar.

Bagasse.—The fibrous leavings of sugarcane from which juice has been pressed out ; used for boiling the juice ; will easily ignite.

Bell metal.—Contains 78% copper, 22 per cent. tin. Commonly known as *kansi.*

Belladonna.—L. Aetropa Belladonna. Deadly nightshade. *Dhatura* belongs to this family. The leaves and roots are used in medicine externally to relieve pain ; atropine extracted from it. It is also used in applying to the breasts to stop secretion of milk. Internally it is used in asthma and whooping cough as antispasmodic ; for nocturnal incontinence of urine. In belladonna poisoning give stimulants like coffee.

Belladonna, Tincture of.—Prepared by percolating the leaves of *altropa belladonna* with 70% alcohol; contains atropine; used for eyes to dilate the pupil; much used by actresses as "Eye bright lotion"; and as a sedative for sores.

Bengal Fire.—A firework illuminant, made of potassium chlorate and sulphur to which has been added barium or strontium nitrate.

Bengal gram.—A nutritious seed.

Bengal Kino.—L. Butea Frondosa, Roxb.; *Dhak, Palas.*

Bengal Lights.—A specie of fire-work, producing a steady and very vivid blue-coloured fire. Their composition is 28 oz. of sulphur, 12 oz. saltpetre, and 2½ oz. realgar. Let these be well pounded each in quite separate mortars with separate pestles and mixed together gently with a spatula, then sifted, and a portion put into a small paint pot. Cover this over with common paper, and apply a common lighted match to fire it. These are often called blue lights, and are much used as night signals by shipping.

N.B. Fatal accidents have occured by not pounding the ingredients separately.

Bentonite.—Impure aluminium silicate.

Benzene or *Benzol.* Colourless, highly refracting, volatile liquid; vapours highly combustible, melting point 5·4°, boiling point 80°, specific gravity 0·899 at 0°C., obtained from coal tar; dissolves fats and resins; important for dyeing industry.

Benzine.—Obtained from the distillation of petroleum.

Benzoates.—Salts composed of benzoic acid and metallic or alkaline bases. Most of them are soluble in water.

Benzoine.—L. Styrax Benzoic, Dryand. *Gum Benjamin. Loban.* A crystalline substance, without taste or colour, deposited from the oil of bitter almonds.

Benzoic Acid.—*Sat loban.* Habitat, E. Indies. Aromatic acid, volatile crystalline, solid, melting point 121·4°C.; boiling point 249·2°C., prepared from

coal tar toluene. Used in making perfumes, in medicine as antiseptic, and in preparation of dyes; as a fixative. A very good medicine for hoarseness.

Benzoin Gum.—A yellowish brown resinous gum, used as antiseptic ointment and tincture, and as incense. Ver, *loban.*

Benzoline or **Benzine.**—A kind of paraffin from distillation of petroleum; highly combustible.

Benzyl Alcohol or **phenyl carbinol.**—A colourless aromatic liquid, b. p. 206°C.

Benzule.—A newly-discovered compound inflammable body, of which benzoic acid is an oxide, and oil of bitter almonds, purified from hydrocyanic acid, is a hydruret. Benzule besides unites with chlorine, bromine, iodine, sulphur, and cyanogen. Chloride of benzule, with dry ammoniacal gas, treated with cold water, forms benzamide.

Berberin.—A bitter principle, contained from the root of the berberry; *rasaunt.*

Berberis.—*Avan Haldi, Darcheeni.*

Berberis Extract.—*Rasaunt.*

Bergamot Oil.—A limpid, greenish yellow liquid, expressed from the rind of bergamot which belongs to the orange family, used in perfumery.

Berillium.—Synonymous with glucinum.

Beryl.—Double silicate of aluminium and glucinum, occurring in granite rocks.

Betelnut.—*Supari, pungi,* areca nut L. Areca catechu.

Beurca Bhojputrica,—*Bhoj patra, Jauz.*

Bezvar.—*Zahar Mohra.*

Berdwood,—*moosli qand.*

Bile.—A bitter liquid of a greenish or yellow colour, common to most animals; the peculiar secretion of the liver. (See Ox. Gall.)

Bhumia Lacera.—*Kakraunda, Kutuj.*

Bhung.—Indian hemp plant, cannabis sativa, used as narcotic and intoxicant; leaves rubbed over stone slab produce *sulpha.*

Biborate of Soda.—borax, *suhaga.*

Bichrome.—Potassium bichromate, which see.

Biranga.—L. Enbella Robusta, Roxb, *Baeberang.*

Birch.—A hardy tree having silvery cuticle, easily peeled, small irregularly serrated leaves. Fruit has membranous wings. Peels of bark, bhuraj patra, used in ancient times as writing material ; bark yields oil.

Bismuth.—A white or yellowishly tinged brittle metal ; somewhat harder than lead ; easily soluble in nitric acid, but not in hydrochloric acid or sulphuric acid ; combined with other metals, it makes them more fusible ; specific gravity 9·8 ; melting point 268° C. or 480° F. ; expands on solidification ; readily forms alloy. Fusible metal contains lead 1, bismuth 2. Bismuth nitrate and sub-nitrate used in medicine and in glass-making and as cosmetics.

Bismuth Nitrate—Made by dissolving bismuth in nitric acid.

Bitter Apple.—Colocynth (q. v.) Ver. *Hanzal, tumma; Indrayan ka phal, Vishtumma,* Pith combined with dill seeds and salt forms an excellent stomachic.

Bitter Water.—The water that remains after the crystallization of common salt in sea water, cr the water of salt springs. It abounds in sulphate and nuriate of magnesia, to which its bitter taste is owing.

Bitters.—Vegetable drugs that stimulate secretion of saliva and so act as appetizer ; hops used in making beer.

Bitterwood.—Same as quassia.

Bitumen.—Soft deposits in petroleum tanks ; a term denoting compounds of carbon and hydrogen ; *e.g.*, naphtha, pitch, asphalt. It is a fatty unctuous matter dug from the earth or skimmed off lakes ; used by artists sometimes as a colour, under the name of *Jew's pitch.* It is also soluable as a cement, forming a part of the asphalt cement.

Black Ash.—Impure sodium carbonate.

Blackberry.—*Kalajaman nilaphal ; Jamoa.*

Black Chalk.—A mineral of a bluish black colour, a slaty texture ; soills the fingers. It occurs in Carnarvonshire.

Black Chalk.—For artists, is made in two ways: one is to saw into proper shape slips of charcoal, and afterwards boil them in hot wax. Second. Mix ivory black with soft fine clay, till of the colour desired; mould it up with water of a proper shape, and set it aside to harden. This kind is much softer than the former.

Black Flux.—A material used to assist in the melting of various metallic substances: it is made by mixing together equal parts of nitre and tartar, and deflagrating them together. The black substance which remains is compound of charcoal and the carbonate of potash.

Black's (Dr.) Furnace.—A very serviceable portable furnace; used for chemical operations; may be applied to numerous other purposes.

Blacking.—A compound either in the state of a liquid or a paste; used for putting a black gloss upon leather. The following is an approved receipt for a liquid blacking.

Ivory black and treacle, each	..	12 oz.
Spermaceti oil	..	4 oz.
White wine vinegar ..	..	4 pints.

Black Jack.—Miners give this name to blende, which is an oxide of zinc.

Black Lead.—A mineral used for making pencils for artists, crucibles for founders and chemists, as a powder to diminish friction, to put a polish upon stoves, and other iron work, &c. The best is brought from the mines of Cumberland and Ceylone, it occurs in large roundish masses, embedded in different kinds of rock. For its chemical properties, see Plumbago, by which name it is chemically known.

Black Oxide.—Cupric oxide.

Black Wadd.—One of the ores of manganese.

Black Pepper B. L. Piper Nigrum, *Gol Marich, Kala Mirich; Filfal gard.*

Blanc Fixe.—Barium sulphate.

Blanched Copper.—An alloy of 8 ozs. of copper and ½ an oz. of neutral arsenical salt, fused together under a flux, composed of calcined borax, charcoal dust, and fine powdered glass.

Blast Pipe.—A pipe employed in locomotive engines to convey the waste steam up the chimney, and to urge the fire by creating a quicker draught.

Blasting.—An operation resorted to in mines and quarries, for the purpose of detaching large masses, of earth, stone, or metals. The operation is as follows :—A hole is bored in the stone, 1, 2, or 3 feet deep, according to circumstances, and $1\frac{1}{2}$ inches in diameter; a charge of gunpowder, made like a cartridge, and with a slow match to it, is then put in, and sand or clay put at the top of it, so as to fill the hole. The fusee or slow match is made to burn a certain time before igniting the powder, to allow the workmen to get out of danger.

Blast Furnace.—An enclosed fire-place, the heat of which is increased beyond that of an ordinary furnace, by a strong current of air driven into the fire by means of a forge bellows, or some other blowing machine.

Blaud's Pill.—Pill ferri, used as tonic.

Bleaching.—The chemical art by which the various articles, used for clothing and other purposes, are deprived of a dark colour, and made to assume a whiteness not natural to them. The bleaching agents generally employed are sulphur dioxide or bleaching powder. (see next).

Bleaching Powder.—Calcium chlorohypochloride. See p. 71.

Blubber.—Layers of fat from whale, oil used in soap-making, leather-dressing, and for lubricating delicate machinery of watches and typewriters.

Blende.—Native zinc sulphate.

Bloodstone.—Red hematite.

Blue Gum.—Tall Eucalyptus tree; source of eucalyptus oil.

Blue Pill.—Mercury pill, contains one-third pure mercury.

Blue Powder.—See Powder Blue and Stone Blue.

Blue salts.—Nickel sulphate.

Bluestone.—*Neela thotha,, tootia,* copper sulphate, prepared from copper pyrites or by the action of sulphuric acid on copper : used in agriculture, as

parasiticide, in medicine, in making copper colours, in batteries, and in blue-washing the walls. Additions of one-sixteenth part of potassium bichromate imparts green colour to the walls.

Blue Verditer.—Basic copper carbonate, *Zangar.*

Blue Vitriol.—Copper sulphate, *neela thotha ;* see blue-stone above.

Brass.—Alloy of copper and zinc, copper 3, zinc 1 or 2; prepared by fusing both in graphite or clay crucibles ; or 67% copper, 33% zinc; highly tenacious, malleable, ductile ; makes good castings ; 2 to 4 per cent of iron mixed in the alloy makes it harder.

Brassing.—The soldering together of metals by means of an alloy of which brass forms the principal ingredient. On account of the great heat requisite to melt brass, it is not used as a solder, except for the metals which are fused with difficulty, such as iron copper, &c., Articles of jewellery, though the parts are joined together with brass, are said to be soldered, and not brazed.

Brazil Wood.—The wood of one species of the Cisalpina. It gives out its colour to water, producing a fine, though fleeting red : it is that from which red ink is manufactured ; *Katahli, chhamak nimoli ki qism ka ek per.*

Boerhavia Diffuse.—*Sant, Zand Qarqa, Vish-sapda.*

Bonduc Nut.—*Latakaraj,*

Boma latifolia, *Mowra ; Mehwa.*

Bone Ash. Bone earth, phosphate and carbonate of lime, left after burning the bones in presence of air ; source of phosphorus and phosphoric acid. For detailed article, see p. 31.

Bone-black.—Animal charcoal, made by heating bones in closed vessels ; contains 10 per cent carbon with calcium phosphate etc. ; a powerful decoloriser.

Bone Oil.—As pointed out above is extracted during the dry distillation of bone-black. It has an evil smell.

Boracic Acid.—See BORIC ACID.

Borate of Soda—Obtained by combining BOR-ACIC ACID with any carbonate.

Borax, *suhaga,* biborate of soda, imported from Tibet ; used in making porcelain and glass ; as a starch glaze ; as preservative of foodstuffs ; for soldering and welding , for securing, a clean surface in laundry.

Boric or Boracic Acid.—Hydrogen borate, obtained from hot springs of Tuscany, Lipari Islands and Western America ; also by the interaction of sulphuric acid and borax or by mixing strong hydro-chloric acid with a hot solution of borax and filtering the cool solution.

Boron.—The metallic base of borax is acid, dis-covered in 1807 by Sir H. Davy. It is obtained by heating in a copper tube 2 parts of potassium, with 1 of boracic acid, previously fused and pounded. The fused matters are washed out of the tube with water, and the whole put upon a filter. The boron remains in the form of a brown, insipid, insoluble powder ; a non-conductor of electricity ; not acted upon by water, air, alcohol, ether, or oils, but when heated nearly to redness, it burns with difficulty into boracic acid, which is its only known combination with oxygen. It unites with chlorine and fluorine.

Bowstring Hemp, *Murba, midhurasa.*

Brick. A kind of artificial stone, formed of a mixture of clay, sand and ashes, hardened by long continued burning.

Brick, Oil Of.—The liquor which comes over in the destructive distillation of various, kinds of the fixed oils ; these are decomposed at a little above their boiling point, or at about 600°; the vapour that now passes over is acrid, sour, and empyreumatic. It is called oil of brick because as a brick was often soaked in the oil, and then submitted to destillation, it being thought that it derived some part of its peculiar pro-perties from that circumstance. It is much used by seal engravers and gem cutters as an oil.

Brine.—Salt water.

British Gum.—The trivial name given to starch, altered by calcination in an oven, whereby it assumes

the appearance and acquires the properties of gum. It is used as a dressing to numerous woven fabrics, as well as to thicken the colours used by the calico printers.

Brimstone.—Sulphur.

B. P., British Pharmacopœia.

Bremen Blue.—Basic copper carbonate; *Zangar.*

Britannia Metal, white alloy of zinc, antimony, copper, and bismuth; used for cheap teapots, spoons, forks, etc. Melt together 4 ounces of plate brass and 4 ounces of tin; when melted add 4 ounces of bismuth, and 4 ounces of regulus of antimony.

Broad Bean, *Baqla.*

Bronze, *kansa pital*; contains 80 to 90 per cent copper: 10 to 20 per cent tin; various proportions of zinc, iron, phosphorus, silicon, and manganese being added to replace part of tin; used for making coins, bells, and statues.

Bronze, To.—To give to wood, plaster, metal, &c., such a surface as to make them appear as if made of bronze. This is done by means of a bronze powder; the article being first painted and varnished, and the powder then sifted over such parts of it as are to appear metallic. It is usually done on metallic articles, such as lamp stands, &c., by slightly warming them, and then washing them over with a liquid which slightly corrodes the surface, (See Browning, &c.)

Bronze Liquid.—Melt in 14 ounces of vinegar 2 drams of sal-ammoniac, and half a dram of salt of sorrel, (binoxalate of potash); rub this over the object to be bronzed with a soft brush, till the required tint is obtained. Liquid to imitate antique bronzes is made by dissolving 1 part of salammoniac, 3 parts of cream of tartar, and 6 parts of common salt, in 12 parts of hot water mixing with the solution of sulphate of copper.

Bronze Powders.—Metallic powders capable of communicating a bronze-like colour to those objects over which they are spread. Aurum musivum, or the bisulphuret of tin, is the most common, and is used for plaster figures, &c. Dutch leaf ground to a paste with honey, makes a fine bronze powder. Copper powder, as precipitated from a solution of the nitrate of copper by clean sheets of iron, is another. *See also Index.*

Bronzing Salt.—Chloride of antimony; so called from its general use in browning or bronzing gun barrels, &c.

Broom Tops.—L. Cytisus Scoparius, *Bauhakaran da boor; jhaoo ka boor.*

Browning or Bronzing.—Gun barrels, or of other iron articles may be done by washing them over with dilute muriatic acid. When somewhat corroded, they are to be rubbed smooth and varnished. The following method may also be recommended. Grind up the butter (chloride) of antimony, with olive or sweet oil, rub it upon the iron slightly heated; and afterwards expose it to the air, till the desired colour is obtained. It is afterwards to be varnished.

Brunswick Green.—Chloride, or submuriate of copper; it may be made by adding oxide of copper to a solution of chlorine, or by exposing to the atmosphere slips of copper partially immersed in muriatic acid. It is a colour extensively used by the house painter.

Buchaninia Latifolia.—Charaunji.

Burdock.—L. Arctium Lappa.

Burnt Alum.—*Khil phatkari*, anhydrous potassium aluminium sulphate.

Burnt Ochre.—Ferric oxide.

Burnt Lime.—Calcium oxide.

Burnt Sugar.—or caramel can be obtained by burning molasses on hot plate: yields deep yellow colour on dissolving in water; used for colouring syrups, sweets, etc. see also Caramel below.

Burgundy Pitch.—Turpentine from which essential oil has been distilled.

Butter Antimony.—Antimony trichloride.

Butter nuts.—N. Am. oily nuts.

Butter of Arsenic.—Choloride of arsenic.

Butter of Bismuth.—Choloride of bismuth.

Butter of Cocao.—An oily concrete matter, obtained from the chocolate nut. In appearance it much resembles mutton suet, and is made by bruising the nuts, and boiling the pulp in water, when the oil will

float to the top of the water, and may be taken off when cold. It is used in pomatums.

Butter of Tin.—Perchloride of tin.

Butter of Zinc.—Chloride of Zinc.

Butter tree—A tree found in some parts of India. Seeds yield oily fat or butter for making soaps and candles. In Panjab hills it is known as *makhni.*

Butyric Acid, an acid occuring in butter, having a pungent bad smell, noticed when butter becomes rancid ; *B.P.*, 163 ; *sp. gr.* 0.975.

Butyric Ether.—Pine-apple oil, has fruity smell.

Butyrine.—A peculiar oleaginous matter, procured by M. Chevreul from butter, which serves to distinguish it from animal fats. It congeals at 32° Fahr. ; dissolves in all proportions in boiling alcohol, solution gradually becoming sour. When butyrine is saponified, it yields three distinct acids, termed the butyric, the caproic and the capric acid.

C. Centigrade (thermometer).

Cabbage, *Band Gobhi, Karam Kalla,* native of Britain, and the ancestor of brussels sprouts, broccoli, cauli-flowers, and savoy ; deep ploughed, richly-manured clay or loam soil favourable for its growth. The soil should be rolled before planting, and from time to time raked and hoed afterwards. Can be sown all the year round ; treatment different. To prevent enemies the soil should be dug deeply, agitated, and limed. Caterpillars of cabbage can be picked up with hand or by trapping.

Cacao, same as cocoa.

Cactus, *thohar,* prickly plant ; various varieties angled, round or flattened leaves. The fruit of Opuntia vulgaris is eaten in America and Europe and India as prickly pear or *pan phal* ; the flesh stems of melocactus are fed to the cattle in the dry districts and so cultivation of this variety holds out great possibilities in the dry districts of India, especially during droughts. The cerengigantic variety often attains the height of 70 feet.

Cadel's Fuming Liquid.—An oil-like liquid-impregnated with metallic arsenic, water, and pyro,

acetic spirit; obtained by distilling a mixture of acetate of potash and arsenious acid.

Cadmium.—A metal discovered about 1818. It occurs chiefly in Silesia, in several ores of zinc: it has the colour and lustre of tin and is susceptible of a fine polish. Its fracture is fibrous; it is in texture soft, easily bent and cut, malleable and ductile, and fuses at a heat much less than redness; its vapours. have no smell. In the strong acids it dissolves with disengagement of hydrogen, forming colourless solutions. The only oxide is of a brown colour; its sulphuret is of a fine orange.

Cadmium Yellow.—a yellow pigment from cadmium sulphide.

Caffeine or theine, a powerful alkaloid of silky, white, crystalline appearance, obtained from tea, coffee, cocoa, kola nut etc.; stimulates the heart and provides cups that cheer but not inebriate.

Cajanus Sativa, *Dal arhar; tuar ki dal.*

Cajeput or **Cajuputi.**—A tree allied to martyle family. The leaves on being fermented and distilled produce a strongly aromatic, antispasmodic and sweat-promoting oil, useful for chronic rheumatism; bark used for roofing and boat making.

CALAMUS, *jal bed; nare.*

Calamine.—An ore of zinc carbonate, *tootia karmani; bhurasak; khaparya;* chiefly used in making brass.

Calcareous Rocks.—Contain calcium carbonate: *e.g.*, coral and limestone rocks, chalk cliffs.

Calcareous Spar.—Crystallized carbonate of lime. One of the purest varieties has the name of Iceland spar, though it is not peculiar to that island. It is remarkable for having the power of double refraction.

Calcination, or **Calcining.**—The process of roasting metallic ores for the extraction of pure metals or metallic compounds by driving out some of the volatile parts *e.g.*, sulphur, carbon dioxide or arsenic.

Calcined.—*murdah; kheel kiya hua.*

Calcite.—Mineral calcium carbonate, occurs as calc spar, Iceland spar (purest variety). Carbon dioxide driven off by calcination or by treating with acid.

Calcium.—The metallic base of lime first separated from the earth by Sir H. Davy. Lime is an oxide of calcium. The salts of lime are now more properly called the salts of calcium, as we speak chemically of the chloride of calcium, &c.

Calcium Carbide.—When acted upon by water gives out acetylene, a gas which burns with a brilliant flame. *see also Carbide below.*

Calcium Chloride.—BLEACHING POWDER *See Part I* p. 71.

Calcium Hypophosphite.—Obtained by the action of phosphoric acid on lime water.

Calcium Phosphate.—See Bone Ash p. 31.

Calcium Sulphide.—Obtained by heating gypsum with coal.

Caliber, Calibre, or **Caliper.**—The diameter, whether external, or internal, of any round body; thus we speak of the calibre of a rocket, cannon, shaft, &c.

Calibration, the process of finding out the place and amount of variation in scientific measurement.

Calico.—From the town of Calicut where originally calicoes were printed, is grey or bleached cotton cloth. All sorts of chhintz come under this heading.

Caliche.—Impure sodium nitrate, *Shor-i-zamin; reh ; kallar.*

Calico Printing.—The art of producing upon calico and other similar cotton fabrics, designs or patterns, combining a variety of colours, so as to produce a pleasing effect.

Calustrus Paniculata.—*Mahlkangni.* Grows on the Himalayas, in Bihar, Bengal and Burma; Oil expressed from the seeds by destructive distillation; is diuretic and diphoretic; best remedy for *Beri-Beri;* a powerful stimulant, taken on betel-leaf promotes memory.

Calomel.—Mercurous chloride, from native mineral called horn quicksilver, or from a mixture of mercury

and corrosive sublimate; a white, crystalline, heavy and tasteless powder, antiseptic, purgative, antibilious.

Caloric Value.—The capacity of a substance in giving out or absorbing heat.

Caloric, Specific.—Although all substances, possess some quantity of caloric which is latent, yet the quantity in each varies with the nature of the body. The relative proportion that any body retains without the effects being sensible, is termed the specific caloric of that body, and its power of retention is called its capacity for caloric.

Calotropics gigantae *Akimadar*; medical uses very many. Leaves can be pickled; the cloves of flowers mixed with other medicines best stomachic and a good remedy for cholera; floccus used in stuffing cushions etc.; milk bitter and poisonous.

Calorie. = 3·96 British Thermal Unit.

Camel's Thorn.—*Aroosa ; Jawasa*

Camphene,—see Terpene.

Camphine.—*Tabasheer; Ban* salochan; bamboo manna.

Camphor, *Kafoor, Kapoor.*—A volatile and aromatic compound having the same structural formula as turpentine; white, crystalline, and semi-transparent; melting point 175°C., boiling point 204°C; soluble in alcohol and ether, chief source cinnamonum camphora of Japan and China; used as incense; in medicine, and in the manufacture of celluloid and cheap fountain-pens and toys which consume large quantities. For Powder camphor, see Part I.

Camphoric Acid.—When camphor is repeatedly distilled with nitric acid, and is in the form of plumose crystals, which are, like camphor itself, it is very readily soluble in alcohol, but with difficulty in water. It combines with the usual salifinible bases.

Cannabas Indica.—Hemp; *Bhang*.

Canada Balsam,—A kind of turpentine, derived from balsam fir, native of North America; used in varnishes, and in mounting microscopical objects.

Cannabus sativa, *bhang*.

Cannel Coal.—A species of coal, which contains a large proportion of bitumen; it burns with a bright flame, has a smooth surface when broken, and is much less friable than coal in general, on which account it is often turned into ornaments, snuff-boxes, &c.

Cannon, Electrical. (See Air Pistol.)

Cantharides—*Telani makkhi;* Spanish flies or blister beetles; body juice produces blister; tincture from juice used in hair tonics. soluble in chloroform or ether.

Cantharidin.—The active principle of cantharides. It was procured by Rrobiquet, in small brilliant mecaceous plates.

Caoutchouc.—Gum Elastic, or Indian Rubber A milky juice, exuded from numerous trees, particularly those of the fig tribes; concrete by exposure to the air, or to the heat of a fire; is insoluble in water and in alcohol, but soluble in pure ether, in hot naphtha, and the fixed oils; but little acted upon by the acids, or strongest alkalies, and not at all by any of the gases. Used extensively in the manufacture of water-proof cloth, as a garnish for balloons, and by artists as a means of removing marks made by a black lead pencil, almost the only concrete vegetable product which contains no oxygen; consisting, according to Dr. Ure, of 9 parts carbon to 1 hydrogen, being 3 atoms of the former to 2 of the latter.

Caoutchouc, Solution of.—May be made by cutting caoutchouc into small pieces, then soaking it in hot naphtha, made by the distillation of coal tar for some hours, when it swells to 30 times its original bulk; it is now to be pounded, and more naphtha added, and the heat being afterwards increased to boiling, the caoutchouc dissolves, forming a thick, clammy, transparent solution. A solution may also be made by treating it with spirits of turpentine in the same manner. Both solutions are tedious in drying, particularly the latter, though this is not so disagreeable in odour as that made by the coal naphtha.

Caoutchoucine.—An inflammable liquor, procured from caoutchouc by distillation; one of the most remarkable substances in as much as although the

liquid itself is the lightest known, yet its vapour is heavier than that of any other substance. It is, when mixed with alcohol, a ready solvent for all the resins (even copal) and that without heat, it also mixes with oils, and is valuable when used along with painting oils, as it dries them quickly without doing injury to the most delicate colours.

Caper Plant.—*Kareer*, flowers bright pinkish red; fruit green berries pickled; very good for flatulent people.

Capric Acid.—A fatty acid from rancid butter, with malodour suggestive of goat smell; produced along with caproic acid and butyric acid from butter.

Capsicin.—An alkaline principle, discovered in cayenne pepper.

Capsicum.—*Lal mirach*, an annual or herbaceous evergreen plant, cultivated in tropical and subtropical countries for condiment and for medicine as stomachic; small type called chillies; extensively cultivated in India, the best varieties in Lahore Division; second best in Ambala Division along the Jamuna.

Carat.—An imaginary weight to indicate the proportion of a precious metal in any mass. The mass being supposed to be divided into 24 equal parts, a carat is one of these parts; and the metal is said to be so many carats fine, or to have so many carats of gold, etc., in it. Pure gold is, therefore, 24 carats fine, if alloyed with half copper it will be 12 carats fine, and so on.

Caramel or burnt sugar is made by burning sugar or glucose or molasses above their melting point, alone or with the addition of ammonia to neutralise any acid present; used in colouring yellow, in beer-making and in syrups etc. *See also Burnt sugar above.*

Caraway.—The aromatic seeds of an umbelliferous plant; contains an essential oil; useful as carminative and stimulant, and in scenting liquors. Caraway chaff is a low grade oil used for soap making. Ver. *Soya. Indian Caraway; siyah zira.*

Carbide.—Compounds of carbon with metal, made with electric furnace. Calcium carbide made by

reducing lime with carbon of coke and silicon carbide by similarly reducing sand. Silicon carbide is known as carborundum and is extremely hard, used as abrasive. Cementite is carbide of iron and useful in the manufacture of steel and iron.

Carbohydrates contain carbon, hydrogen, and oxygen, *e.g.*, sugar, starch.

Carbolic Acid.—Phenol, a colourless and crystalline solid with strong smell and caustic taste, sp. gr. 1·09, melting point 42° C., boiling point 183° C. Coal tar mixed with soda yields sodium phenate, which treated with sulphuric acid and distilled fractionally evolves carbolic acid ; disinfectant, antiseptic, used in ointment, oil, spray, lotion or dressing, internally in small doses to prevent fermentation in stomach and bowels. Salicylic and picric acid made with its help.

Carbon.—One of those chemical substances supposed to be simple or uncompounded. In its crystalline, and perfectly pure state it is known as the diamond. In its uncrystalline form it constitutes charcoal, which may be called wood carbon, and which is the residue of wood which has been burnt without contact with the air. Animal charcoal, or ivory black, is carbon produced by burning bones, and other parts of animals in a similar manner. See also p. 484.

Carbonates.—Salts formed by the combination of carbonic acid with alkalies, earths, and certain metallic oxides. The carbonates used in the arts are chiefly the following :—

Carbonate of Ammonia.—A salt, called in modern chemistry the sesquicarbonate of ammonia, to indicate its composition to consist of 1 and a ½ atoms of carbonic acid to 1 of ammonia. This salt is the common smelling salts of commerce. It is much employed in medicine, in chemical analysis, and by the pastry cooks instead of yeast ; by exposure to the air, the ammonia exhales, and it becomes the scentless bicarbonate. It is now obtained by the direct combination of ammonia and carbon dioxide in presence of moisture, or by subliming an intimate mixture of

ammonium sulphate and chalk. *See also Smelling salt, P. 183.*

Carbonate of Copper.—Malachite; a beautiful green mineral, used in brooches, for seals, etc.

Carbonate of Lead.—White Lead; used as a white colouring matter by the painter. It is made by subjecting plates of lead to the fumes of vinegar, and afterwards decomposing the acetate of lead thus formed by a carbonate.

Carbonate of Lime.—Chalk, limestone, etc. In a crystalline form it is called calcareous spar, (which see), and Iceland spar or double refractive spar.

Carbonate of Magnesia.—Much used in medicine as an absorbent, to correct acidity, in face powders, etc.

Carbonate of Potash.—Better known as wood ashes, potash, and pearlash, according to its state of purity or impurity; made by burning wood and terrestrial vegetables, dissolving the potash out of the ashes, and afterwards evaporating the liquor to obtain the potash held in solution; also made from tartar in the same manner; in that case the residue being called salt of tartar. Pearlash is very soluble in water, and exposed to the air it deliquesces, forming what is called oil of tartar *per deliquium.*

Carbonate of Soda.—Obtained in the same manner as the carbonate of potash, but using marine vegetables, or by decomposing sea salt, like the last, extensively used in the arts, in the soap and glass manufacture, and in medicine.

Carbonic Acid, Carbonic Acid Gas, Fixed Air, Aerial Acid, Choke Damp, etc.—A union of oxygen and carbon, in the proportion of 1 atom of the latter to 2 of oxygen. Its natural state is that of a gas. It combines with most of the alkalies, metallic oxides, earths, etc., forming carbonates. Its specific gravity is half as much again as of water, or 1·5245. It therefore sinks in the air. It exists abundantly in nature, in chalk, marble, limestone, etc., each grain of which will yield 1 cubic inch of gas. It frequently occurs in mines, pits, and wells. It is yielded in abundance by bodies passing

through the vinous fermentation, and is absorbable by water. It cannot be inhaled for a single minute without destroying life. Carbonic acid gas may be condensed into a liquid state by a pressure of 40 atmospheres, and this liquid may then be solidified by the cold produced by its own spontaneous evaporation. The liquid is solidified and sold in the market as Dry Ice. A little bit of it added to any sherbet or juice will aerate it, and give the decided taste of aerated waters. It is used as an anæsthetic in surgery.

Carbonic Oxide.—Gaseous oxide of carbon. A gas obtained by subjecting carbonic acid gas to the action of substances that abstract a portion of oxygen, It may be produced by heating in an iron retort, a mixture of chalk and charcoal, or equal weights of chalk, and iron or zinc filings. It is lighter than atmospheric air, has no taste and little odour, extinguishes flame, and burns with a blue light when heated and exposed to atmospheric air. It does not affect vegetable colours, occasions no precipitate with lime water, and is very sparingly absorbed by water. Very poisonous.

Carbon, Varieties of.—*Diamond* is the hardest known solid. It can scratch all other bodies; transparent with high refractive index; crystals octahedral; precious stone for gems and for cutting glass. *Graphite* or *plumbago*, or *black lead*, solid gray black, shining, six-sided plated or powder, used as lubricant for polishing iron, and for making pencils. Sp. gr. 2·6. *Charcoal* is amorphous carbon; black, soft, porous, solid, with specific gravity 1·6 to 2, a good absorbent of gases and, as such, a disinfectant. *Bone Charcoal* used in refining. *Coke* is the residue of gas coal. *Lamp Black* obtained from burning oil lamps. *Coal* is a natural form of carbon containing many impurities. All compounds are tasteless, smell-less, infusible and insoluble in any liquid.

Carbolate of Lime.—Lime water with carbolic acid.

Carbonate of Soda.—Ordinary soda, sal soda.

Carbonates—Are salts of carbonic acid, *e.g.*, calcium carbonate. Bicarbonates are salts in which only one atom of hydrogen has been displaced.

Carbon Bisulphide *or* **Disulphide.**—A heavy, colourless and volatile liquid, specific gravity 1·292, boiling point. 46°, poisonous, highly combustible, can dissolve phosphorus, used as insecticide and as solvent of sulphur, chlorine and in vulcanising India-rubber; made by passing sulphur vapour over red hot chemical charcoal, and condensing the vapour in a freezing mixture.

Carbon, Disinfecting.—Naphthalene, popularing though wrongly called in India *phenyle ki golian.*

Carbon Disulphide.—Same as carbon bisulphide

Carborundum.—A silicide of carbon, colourless and crystalline solid when it is pure, brown to black when impurities, so hard as to scratch rubies; prepared at the Niagra Falls on account of cheap electric power, by treating sand with coke in electric furnace, useful for polishing glass, jewels and metals. It is also prepared by fusing a mixture of petroleum residue, coal or pitch, with fine quartz sand and a little sand in an electric furnace. Ready made carborundum wheels are sold at Hardware merchants' shops. Cheap electricity from Mandi Hydro-electric station offers possibilities.

Carburet of Sulphur.—Called also **Sulphuret of Carbon** and **Alcohol of Sulphur.** A limpid volatile liquid, of a penetrating fœtid smell, and an acrid burning taste. Its specific gravity is 1·265, and its boiling point about 112° Fahr. It evaporates so readily, and absorbs so much heat in the vaporous state, that if a tube containing quicksilver, surrounded with lint dipped in it, be suspended in the receiver of an air pump, and the air exhausted, the quicksilver will be frozen. It consists of 15·8 carbon and 84·2 sulphur, in 100 parts.

Carburetted Hydrogen.—A compound of carbon and hydrogen, of which there are several species—some gaseous, others liquid; such as Oil Gas, Coal Gas, Olefiant Gas, Naphtha, Caoutchoucine, etc.

Cardamoms—The fruits of a plant of the ginger family, true varieties being native of Southern India and Ceylon. Cardamom major, *Bari elaichi,* used as spice, in flavouring confectionery and in making *Elaichidana,* cardamom drops; *cardamom minor* used

for chewing and in medicine. Essential oil of cardamoms is carminative and is much employed in pharmacy. Ver. cardamom major. *Bari elaichi*, cardamom minor, *Chhoti elaichi*.

Carminatives.—Medicines calculated to remove flatus from the alimentary canal by increasing its muscular action; anticolic. They have spicy smell and soothing effect on the bowels, prevent griping: *e.g.*, cardamoms; anise; cumin seeds.

Carmine.—The crimson colouring principle obtained from the insect called cochineal (q.v.) *bir bohti*, by precipitating the colouring matter of cochineal. Powder 4 oz. of Cochineal and add to it 4 quarts of rain water previously boiled, boil the whole 6 minutes, adding 2 drams of powdered crystals of tartar, and then 160 grains powdered alum. Let settle. Drain off the supernatant water. Dry gently the precipitate, which is carmine.

Carnallite.—Magnesium potassium chloride.

Carnauba Wax.—Is given out by the leaves of the Brazilian wax palm. It is used in the manufacture of candles, polishing pastes (wax varnishes and phonograph cylinders) and in making best boot polishes.

Carron Oil.—Linseed oil and lime water. For improved variety, see p. 349.

Carrot.—*Gajar ; gazar ; zardak*.

Carthamus Oil. *Kusum oil*.

Carthamus or Safflower.—An annual plant, cultivated in Spain, Egypt, and the Levant. It is used in dyeing: yielding two colouring matters, one of a yellow colour, which is soluble in water; the other a fine red colour, which is soluble in alcohol and alkaline solutions. The latter is that which is most useful: it is the colour called rouge, as used by ladies to brighten their complexion, and is also the ingredient which forms the colouring matter of pink saucers. ver. *kusumba*.

Cascara Sagrada. Sacred bark of a Californian tree, or dry liquid extract used as aperient.

Cascarilla Bark.—Bark of croton eleutheria, native of West Indies: odour aromatic, taste bitter, used in medicine and as incense.

Case hardening, or carbonising is to increase the surface hardness of soft iron, mild steel, nickel, steel, etc., by increasing the amount of carbon in the skin, hardness increasing at the expense of toughness. Process useful where an article is subject to great friction. For this purpose put the article in a steel box, pack with leather pieces, bone dust and horn waste, bring to bright red heat in gas furnace, temperature and duration of heating being regulated, let the box cool slowly, clean the article, reheat and cool by dipping in water.

Casein.—A nitrogenous compound from coagulated milk, cheese being impure casein. It can readily be made by coagulating milk with acetic acid and by washing with water.

Cashew Nut.—*Anacardium Occidentala, Hijli or Kaju Badam.* Pb. *Khaja.*

Cassia.—*Tejpat.*

Cassia Elate.—*Panwar.*

Castile.—A fine hard white or mottled soap made with olive oil. Useful in making pills and for plasters.

Castor Oil.—*Erindi ka tel, rogan bed anjeer,* see Part I, p. 37.

Catalysis.—The process of a chemical producing change between other chemicals without in itself undergoing any change. Thus manganese dioxide being added to potassium chlorate accelerates the production of oxygen. Ammonia and oxygen combine on heated platinum, but the metal in itself remains unchanged.

Catechu.—*Katha, catch khadar,* black catechu, *Khair* B. *Acacia, catechu wild.* See p. 45.

Catgut, or Gut.—Horny material used in making ropes for combing cotton, violins, guitars, harps, sheep's or bovine intestines being chief source. The intestines on being quite cleaned are scraped and subjected to antiseptic fumes, and finally twisted into ropes.

Cathartin.—An alkaline substance, found by M. Lassaigne and Femneule, in the pods of leaves of senna. It is soluble in hot and cold water, and alcohol, not in ether ; is nauseously bitter ; of a peculiar odour, and of a yellowish brown colour.

Cathode.—The negative pole of a battery.

Caustic.—A burning substance, like lunar caustic, (silver nitrate) or concentrated nitric acid, or caustic potash or soda, kills the part to which applied and expands the blood vessels. Caustic soda extensively used in bleaching *vanaspati* ghees; kills the vitamins and irritates the throat.

Cauli Flower.—*Phool gobhi.*

Caustic Lime.—Quick Lime: *Anbujha choona.*

Caustic Potash.—Potassium hydroxide.

Caustic Soda.—Sodium hydroxide.

Cayenne Pepper.—*Lal mirach.* preparation from chillies, hot and stimulant and pungent, action due to capsicine alkaloid.

C. C.—Cubic centimeter. 1 c.c. of water weighs 1 gram.

Cedar Gum.—White transparent resin from cedar formerly used for embalming and for polishing hieroglyphic MSS. *Cedar, cheel deodar, kail partal, andhar.* Cedar gum is known as *sookha behroza.*

Cedarwood Oil, or Oil of Red Cedar—Is distilled from the wood of red cedar, used in perfumery and in microscopy.

Celery Seeds.—*Pitarseli, silara.*

Celluloid.—Plastic mass, produced by solution in camphor of nitrocellulose which is obtained by treating cellulose (cotton or tissue paper) with nitric and sulphuric acids.....Not acted upon by atmosphere or water, can be coloured and, when plastic, at 75° C. moulded; when hard, can be carved and turned; highly inflammable, used for collars, combs, buttons, billiard balls, and for innumerable other articles. *Waverly Encyclopædia. See also Celluloid Toys, Part I, Chapter XVIII, P. 240 and Cellulose* below.

Cellulose.—The chief component of vegetable cells, a carbohydrate, obtained by boiling cotton or linen or paper waste, with alkali, alcohol or ether to drive out impurities; insoluble in water or alcohol; soluble in ammoniacal solution of copper hydroxide; treated with dilute sulphuric acid and iodine produces blue colour; treated with sulphuric acid, diluted with water

and then boiled changed into dextrose (grape sugar). Unsized paper bathed in strong sulphuric acid is made parchment paper. Inflammable nitrates, gun cotton, collodion, celluloid, made by treating cellulose with strong nitric or better nitro-sulphuric acid, and drying. Commercial artificial silk obained by treating cellulose first with caustic soda and then with carbon bisulphide, when a thick brown syrup called viscose is made. Cellulose used in paper-making and in textile industry. See also Part I. Chapter XVIII.

Cellulose Acetate. Made by treating cellulose with acetic anhydride. Its solution in acetone is termed dope. If the acetone solution is allowed to evaporate the cellulose acetate is left as a film of great tenacity and lustre. It renders taut and impermeable the fabric of aeroplane wings; also used for the production of photographic films, and as an insulating varnish for electrical wires.

Cements.—Substances employed to join others in close adhesion which would not otherwise unite. For this purpose they are employed in a semifluid or pasty state so as to be brought into closer contact with the opposite surfaces and becoming solid as the moisture exhales, or in other cases as they become cold the whole forms as it were one.

Centauria Behman.—*Behman surakh, Behman sufaid*

Centrifugal Machine.—An appliance for rotating a liquid with a view to separating it from the solid or heavier portion.

Cerium—An iron grey metal derived from monozite in Brazil or Travancore. Sparkling substance of cigar-lighters is cerium iron alloy, incandescent gas mantles made from cerium oxide.

Ceruse.—Basic lead carbonate.

Chalcedony.—A hard flinty stone, often cut into seals. Cornelian is one of the species of chalcedony, so is the onyx stone. It belongs to the quartz family; consists of quartz and opal; generally translucent. Agate and some pebbles are chalcedony.

Chalk.—Calcium carbonate, *Kharya mitti.* The ordinary chalk crayons used in schools contain calcium sulphate or plaster of paris, and not calcium carbonate. For precipitated chalk see Part I. P. 249

Chamomille.—*.Baboona.*

Champagne. Wine produced from grapes in Champagne in France. White or pink, sparkling. Chalky soils produce the best variety.

Charcoal.—Half burnt wood that is wood so dried by fire as to have the whole of the oxygen and hydrogen which is inherent in all woody substances driven off while the third constituent, carbon, remains, for whose manufacture and properties see Carbon. Charcoal used by the engraver for cleaning copper and steel plates, and also that used by the artist for drawing should be chosen of clean grain without knots and with every particle of bark or other impurity scraped away. Willow, alder and poplar are most esteemed by the latter; to burn in oxygen it should be the bark or near the outside of the stick because such throws off more beautiful sparks. The charcoal most proper for galvanic deflagration is always made of box wood. Cut the wood into slips with a saw; nearly fill a crucible with the slips, cover these entirely with sand and put the crucible in the fire; after the whole has become red hot, let it remain so half an hour, and the charcoal is ready. The more it is burnt, the better conductor of electricity charcoal becomes, that is, within certain limits. Oak, and Kikar make very good charcoal for heating purposes. The pine tree charcoal is soft, and is greatly esteemed by the gold and silver smiths.

Chaulmoogra.—*Hydrocarpus Wightiana,* Blume. *Taraktogenos Kurzil,* King.

Cheese.—See Casein above.

Cheese Cement.—A kind of glue, particularly serviceable in joining broken china, wood that is exposed to wet, painter's panel boards, etc. It may be made as follows: Pound some cheshire cheese, wash away the soluble part with warm water, dry the remainder, and mix it with quicklime. Pound them together, and when wanted for use, add water to make the mixture of a proper consistence. This cement laid

on like glue, dries quickly, becomes very hard, and when dry cannot be afterwards dissolved.

Chemical Action.—The effect which takes place when two bodies combine or are disunited from each other, one or both bodies being altered in properties by the combination or disunion. Thus, chlorate of potash and sulphuric acid show when united a chemical action, as they burst into flame and are resolved into other substances. This action may be induced by mixture as above; by heat as in firing gunpowder; by electricity as in the decomposition cf water; by light as in the blackness induced upon nitrate of silver when exposed to the sun; and by other causes, such as pressure, cold etc.

Chemical Furnace.—Such a furnace as is adapted to chemical purposes. It ought to be capable of heating vessels not merely as in a common fire, but if necessary, such as may be used as a blast furnace. It should also be furnished with a tube running through the fire for the decomposition of liquids, and with a sand bath for the gradually drying of powders and heating of glass vessels.

Chemical Thermometer.—A thermometer, the size of which is not exposed to a contact with corrosive liquids. The French chemical thermometer is mostly a glass tube, which contains a thermometer and scale, or else the scale alone is defended by the extra tube. The English chemical thermometer is made and graduated like the common one, except that the lower part of the scale is made with a hinge which folds back, so that the ball alone is immersed in the liquid, the temperature of which is to be ascertained.

Chemistry.—Chemistry is *defined* as an art which teaches us the properties of the elementary substances and of their mutual combination It inquires into the laws which affect, and into the powers which preside over, their union; it examines the proportions in which they combine, and the modes of separating them when combined; and endeavours to apply such knowledge to the explication of natural phenomena, and to useful purposes in the arts of life. It is divided into *Organic Chemistry* and *Inorganic Chemistry*, the

first treating of organized bodies, such as plants and animals; the other of unorganized, such as minerals and factitious products. The latter division of the subject is further subdivided into analytical and synthetic, or the art of separating and the art of combining bodies; also that part of inorganic chemistry which relates to the gases is often called *pneumatic chemistry*.

Chenopodium.—*Bathwa,* a potherb that grows widely in the fields. Pb. *Bāthu; jau-sāg.*

Chevica Ofli.—*Chuka, Chukra.*

Cherata. A kind of gentian root.

Cherry.—*Walayti mako, alu balu ; shah dana.*

Chicory.—A native of Western Europe, leaves used as salad; dried, roasted roots adulterated with coffee.

Chill Hardening.—A method of tempering steel cutting implements, by subjecting them, when red hot, to a strong blast of cold air, by which they become hardened, as if they had been plunged into cold liquid, though more delicately. It is said that the method succeeds best with case-hardened goods.

Chilli Saltpeter.—Sodium nitrate, *shora.*

Chillies.—Capsicum Annuum, and C. Frutescens, *Lunka, Lalmirach.*

China Glaze.—For printing blue ware; is made by mixing 10 parts of glass, 2 parts of lead, and 3 or more of blue calx (residuum).

China Root.—*Smilax China* L. & S. Glabra, Roxb. *Chobchini. Jap. Toojuh.* Used in place of sarsaparilla, as antisyphilitic and aphrodisiac.

Chinese Blue.—Prussian blue.

Chinese Fire.—A composition used in fireworks made by mixing the following ingredients, and ramming the mixture into rocket and other cases: (1) dried saltpetre, 1 lb.; sulphur, 3 oz.; charcoal, 4 oz.; iron-sand, 7 oz. (2) white saltpetre 1 lb; bruised gunpowder, 12 oz.; charcoal, 8 oz.; iron-sand, 12 oz.

Chinese red.—Basic lead chlorate.

China clay.—Kaolin, *pandu, Gopi chandan,* aluminium silicate.

Chinese white.—Zinc oxide.

Chinium.—quinine.

Chiretta—*Swertia Chitretta*

Chloral.—An oily liquid, taste bitter, smell pungent, boiling point 96, specific gravity 1·54, made by chlorine acting on alcohol. *Chloral hydrate* is made from chloral only by adding water to it. Transparent, white and crystalline, used as hypnotic.

Chlorates.—Salts of chloric acid. Soluble in water and source of oxygen when heated. Potassium chlorate used in fireworks, matches and in medicine. Gargles useful in tonsillitis, etc. Large doses poisonous.

Chloride of Cobalt.—Produced by the action of chlorine on cobalt.

Chloride of Lime.—Bleaching powder. See Part I, P. 71.

Chloride of Soda, solution of sodium hydrochloride.

Chlorides.—Salts which are a combination of hydrochloric acid, with bases, formerly called muriates.

Chlorinating.—Impregnating a substance with chlorine.

Chlorines.—Salt gas, greenish yellow gaseous element; melting point —102°, boiling point —34° C.; pungent and disagreeable smell, manufactured for making bleaching powder by the electrolysis of common salt; combined with other gases, used as poison gas in warfare.

Chloroform.—A colourless liquid; pleasant taste and smell; boiling point 61·2°C.; specific gravity 1·526; prepared by the action of bleaching powder on alcohol; used as anæsthetic; volatile liquid containing carbon, hydrogen and chlorine.

Chlorometry.—The estimation of chlorine in bleaching powder, determined by the quantity of sodium arsenite that can neutralise it, the neutral salt leaving no stain on paper moistened with iodine and starch.

Chlorophyl.—The green colouring matter of leaves, stalks, and plant cells, essential for the formation of carbon hydrates. Soluble in alcohols, ether, etc.,

the solution being fluorescent. Commercially it is extracted from nettles or spinach (*palak ku sag*) by percolation with a volatile solvent which can be removed for the next charge by distillation at low temperature. Soluble in oils and waxes.

Choke Damp.—Carbonic acid gas which gathers up in coal mines and so tends to suffocate the miners.

Chromate of Potash. A bright yellow cyrstalline substance, formed by the addition of caustic potash to solution of pot. bichromate. It is generally prepared by exposing a mixture of 4 parts native chromate of iron with 1 of nitre, to a strong heat for some hours and washing out the resulting soluble matter; these washings yield chromate of potash by evaporation. It is in the state of yellow crystals which dissolve in water but not in alcohol. It is valuable to the calico-printers, in the manufacture of chrome colours and as a chemical test precipitating the metals of very different and often beautiful colours. The bichromate of potash is made from the chromate by adding to its solution a sufficiency of sulphuric acid to give it a sour taste, setting it aside for a day or two when deep red crystals will be deposited. This salt is largely manufactured for the use of calico-printers.

Chromate of Lead.—(See Chrome Yellow.)

Chromatics.—That division of the science of optics which treats of the colours of light, their several properties and the laws by which they are separated and their separated parts recombined.

Chrome Alum.—Potassium chromium sulphate.

Chrome Colours.—A name employed by artists and painters to designate any colours which when dry are of that soft powdery consistency that they may be mixed up with oil and form a uniform soft colour without grinding with the muller. Those colours which are truly chromes must have the metal chromium in their composition and are the following, though many other colours besides these would be included in the first general definition :—

Chrome Blue or a blue oxide of chromium; may be made thus :—Make a saturated solution of chromate of potash, add weak solution of potash and weak

sulphuric acid to combine with the potash, Then add one eighth part of common salt and one sixteenth by weight of strong sulphuric acid. The liquor will now assume a green colour It is then evaporated to dryness, then re-dissolved and filtered; finally the greenish blue oxide of chromium is to be precipitated by caustic potash and collected on a filter. It is used chiefly as an enamel colour.

Chrome Green.—A colour extensively used in dyeing and for staining articles of porcelain of a fine green colour. It may be economically and easily made by boiling chromate of potash dissolved in water with half its weight of flowers of sulphur till the resulting green precipitate ceases to increase, which may be really ascertained by filtering a little of the mixture. The addition of some potash accelerates the operation.

Chrome Red.—*Basic red chromate.* This is a sub-chromate of lead made thus: Into saltpetre brought to fusion in a crucible at a gentle heat pure chrome yellow is to be thrown by small portions at a time; a strong ebullition takes place at each addition and the mass becomes black and remains so while it is hot. Let it rest for a few minutes during which the dense basic salt falls to the bottom; the fluid part is to be poured off. The mass remaining in the crucible is to be washed and dried, forming the red powder required. This colour as well as the next are used extensively in dyeing, and by the painter both in oil and in water colours.

Chrome Yellow, Orange, etc., or Chromate of Lead.—A rich pigment of various shades from deep orange to pale yellow; made by adding a limpid solution of the chromate of potash to a solution, equally limpid, of acetate of nitrate of lead. A precipitate falls which must be well washed and carefully dried out of the reach of sulphuretted vapours; a lighter shade of yellow is obtained by mixing some solution of alum or sulphuric acid with the chromate, before pouring it into the solution of lead, and an orange tint is to be procured by the addition of sub-acetate of lead in any desired proportion. *Peori Walaiti.*

Chromic Acid, or Peroxide of Chrome—A ruby-red powder, of a sour metallic taste, extracted from the

red lead ore of Siberia, and also from the mineral chromate of iron. From the former it is procured by treating it with carbonate of potash and separating the alkali by means of a more powerful acid, or it may be made by decomposing any of the artificial chromates. Chromic acid unites with the alkali, and most of the earths and metals, forming chromates. *See also* Part I.

Chromium.—A metal of an iron grey colour, procured by intensely heating its native combinations, which are those of iron and lead, with charcoal. It is brittle, difficult of fusion, and not easily acted upon by acids. It unites with oxygen in three proportions, forming a sesquioxide, a deutoxide, and a peroxide; the last of which having acid properties is called also chromic acid. (see above) It also unites with chlorine, fluorine, sulphur, nitrogen, phosphorus, and carbon.

Cider.—Fermented juice of apples. "The fruit is crushed, run into vats, where it is fermented, and afterwards put into casks and stored in a cool place." *Seb ki sharab.*

Cinchona Bark.—Peruvian bark, now grown on the Nilgiris and in Assam.

Cinnom Aroma.—*Taj, Sulekha.*

Cinchonine, or Cinchonia.—An alkaloid which forms the distinguishing character of peruvian bark and in which alone its medicinal properties appear concentrated. It is extracted from the pale bark, while an analogous substance, called quinia, is extracted from the red bark, the only difference between them appearing to be that the latter contains a double quantity of oxygen in its composition.

Cinnabar.—A beautiful red pigment, composed of sulphur and mercury, hence in chemical nomenclature called sulphuret of mercury. (*See Vermillion.*)

Cinnamon.—The dried inner bark of an evergreen tree, used as a spice and in medicine as a stomachic. The oil distilled from the bark is used in flavouring liquors and in perfumery. Ver. *dar* or *dalchini*, coarse bark, Tas. B. Cinnamomum.

Cinnamon Leaf.—*Tejpat, Patraj, Sazaj.*

Cissus Quadrangula.—*Hathi Jodi.*

Citric Acid.—A tribasic acid which occasions the agreeable sour taste and properties of the lemon, lime, and other fruits. It is made thus: Saturate the lemon juice with chalk, noting the quantity of chalk used. The citrate of lime precipitates, the supernatant liquor is poured off, clean water added, and for every 19 pounds of chalk used, 9½ of sulphuric acid are mixed with it. At the end of twelve hours the citrate of lime will be decomposed; dilute nitric acid will float above, and sulphate of lime be found at the bottom. The acid may be drawn off, filtered and evaporated to obtain the crystals of the acid. Citric acid forms citrates with the usual bases used in medicine, dyeing, and in confectionery. *Tezab Chakodra.* See also p. 290.

Citral.—An essential oil distilled from the rind of citron (*chakodra*), lemon, oranges, and from lemon grass and geranium.

Citric Ether.—When a hot solution of citric acid, mixed with alcohol, muriatic acid, and a certain proportion of sulphuric ether is kept for six or eight hours at a temperature between 125° and 135° and then water added, citric ether separates in the form of an oil-like liquid.

Citron.—A family of evergreen trees and shrubs, orange, lemon, citron (*chakodra*), lime being the chief species.

Citrus Medica.—*Ver. Limo. Pahari Limbu.*

Civet.—An animal of the mongoose family. The unctuous secretion from the civet cat is used as fixative agent and in perfumery.

Clarification.—The process of freeing a liquid from its impurities by throwing them down by a chemical or mechanical mixture added to them. For example, boiling clarifies numerous extracts: hops clarify numerous extracts and clarify beer; alum added to new gin throws down any excess of the oil of juniper, and enables it to mix with water without turning cloudy. These are instances of clarification and as such are not to be confounded with filtering.

Clay.—An earth, consisting of alumina, generally contaminated with silica, and occasionally with lime, magnesia, and various metallic oxides, particularly those of iron. It is readily diffusible in water, forming with it a plastic mass, which may be kneaded or moulded to any shape. It concretes on becoming dry. And when burnt, assumes a state of extreme hardness, shrinking considerably in the fire, and losing its capability of becoming ductile, when mixed with water. Clays are divided into *fire clays*, or such as become extremely hard in the fire, and remain afterwards scarcely altered by it; used for lining furnaces, making crucibles, etc., *common clay*, used in the manufacture of bricks, tiles and the coarser kinds of pottery ware, *potter's* or *tile, clay* becomes white on burning, such as is used for the common white ware, tobacco pipes, etc. *Kaolin* or *China clay*, such as is used in the finer kinds of porcelain. This kind is found not only in China, but in Saxony, France, Spain and England, and in the C. P.

Clerodium.—*Arani, Agnimanth.*

Clerodendron.—*Bharingi*; *Bhadingi,*

Cloves.—*Laung*, the dried flower buds of a tree grown in the East Indies, Zanzibar, and the West Indies. Used as spice, and for making oil, which is used in making liquors, in perfumery, as a preservative, and in dentistry as a local anæsthetic. *L. B. Eugenia Caryophyelata Thumb.*

Coagulation.—The separation of a jelly-like or semi-solid mass from a liquid as the result of heating or adding chemical re-agent or by the activity of micro-organisms or fermentation. White of egg coagulated by boiling it with water, blood by clotting, cheese by compressing fermented coagulated milk. Nitric acid coagulates all albuminous substances.

Coal.—Dead vegetation, carbonized by the action of water and enormous pressure. Destructive distillation of coal yields coal gas, and coal tar as by-product, the chief source of 2,000 aniline dyes of various shades and benzene (which see), the phenols (q.v.) acetanilide, phenacetin, antipyrin, paving preparation, explosives, perfumery, ammonia.

Coal Gas, Uses of.—Ammonia, tar; coke; magenta; mauve, and many other colours are obtained from coal.

Coal Gas.—Coal gas is a mixture of at least seven gases. It is obtained by heating coal in a retort above 400° C. In addition to the gas, tar is also obtained; the greater the heat the less the tar, and the less the illuminating power of the gas. Before collecting the gas it is condensed and purified, during which process the tar is separated out. Coal gas should not be burnt in ordinary Indian houses. Why?

Coal Gas, By-products of.—1. Coke; 2, Gas, carbon used for carbon rods of batteries; 3. Gas lime for agricultural purposes. 4. Tar or coal tar, used as a protective paint for timber; for tarred paper, etc. From it are also obtaind carbolic acid, creosote, benzene, naphthalene, dyestuffs, perfumes, etc.; 5. Pitch used for hard pavements and varnish. 6. Ammonia.

Coal Tar. An oily liquid obtained during destructive distillation of coal, lignite, peat or bituminous shale, the dry residue left being coke. At low temperature fatty liquids are produced, and at high temperature aromatic ones. Coal tar is a complex mixture. On distillation it gives benzene, toluene, phenol, creosote. Used as varnish for iron, stone and timber. In combination with lime forms asphalt for paving the roads. It forms the base for many drugs, dyes and explosives.

Varieties of Coal and their Composition.

It is believed that the greater the pressure under which wood has been buried by the earth layers, the greater is the amount of carbon present in a variety of coal, and the less the volatile matter and moisture.

Peat is the softest kind of coal and anthracite the hardest; the harder varieties give a greater amount of heat—a factor to be recommended in buying coal.

Hard coals burn with difficulty, have short flame, but great calorific (heating) power; softer coals *vice versa.*

Varieties.	Ash	Fixed Carbon.	Volatile matter.	Moisture.
Wood	1 5	25 0	53 5	20 0
Peat	12	29 2	51 5	18 1
Lignite	8 0	43 1	42 7	6.2
Bituminous Coal	6 3	63 5	29 2	4 0
Anthracite	5 4	86 5	6 1	2 0
Graphite (commercial)	26 50	68 30	5 20	Nil.
Graphite (crystalline)	9 90	89 05	10·5	Nil.

Cobalt.—A metal, which is of a reddish grey colour, brittle, and difficult to fuse. It combines with oxygen in two proportions, the *dark blue protoxide* and the *black peroxide*; the former of these varies much in colour. Cobalt also unites with chlorine, iodine, bromine, fluorine, sulphur, phosphorus, and cyanogen. Cobalt is not used in a metallic state, but as an oxide, under the name of *zaffire, smalt,* and *azure blue*. Its employment is either to colour glass and porcelain, which it does of a fine blue colour, or as a pigment for the painter.

Cocaine.—An alkaloid derived from the leaves of coca or cuca, growing in South America, white crystalline, bitter, slightly soluble in water, strongly poisonous, valuable anæsthetic, causes dilatation of pupils of eyes. Natives chew with alkali, and can then go for several days without food.

Cocculus Berries.—L. Cocculus Indicus, *Kakmari*.

Cochineal.—A fine scarlet colour, produced from a small insect of the beetle kind (called *beerbohti*) common in Mexico and the West Indies, which lives upon the *cactus opuntia*, or *Indian fig cactus*, enveloping itself during a great part of its existence in a fine down or web. Its colouring principle is extracted by grinding the insect, and steeping it in water, in which it is very soluble, Alumina rapidly combines with it, rendering the water colourless, thus becoming a fine lake crimson, or violet, according to the temperature of the solution acted upon. The salts of tin also rapidly act upon the colour, forming, according to the salt

used, a violet or fine carmine colour. Cochineal is used for dyeing scarlet and crimson colours, and by the painter, under the name of carmine, q. v. as the finest of all red colours. Cultivation of this insect offers vast possibilities in India.

Cocevulus.—*Kakmari, Zaharmahi.*

Cochonus Humilis.—*Bauphali,*

Cocoa or **Cocao.**—The powder of the seeds of a fruit grown in East and West Indies and Ceylon : makes a nourishing beverage, owing to the presence of fat, starch and nitrogenous matters, the stimulating effect being due to an alkaloid, the obromine.

Cocoa Butter.—A concrete oil M. P. 32° C.; manufactured by pressing crushed seeds of cocoa : used in varnishing creams.

Cocoanut Palm.—A native of moist tropical climate Cocoanut ; a pleasant food, eaten straight or in confectionery, cocoanut milk makes a refreshing drink, useful for making artificial butter and in the manufacture of soap.

Cocoa Plant.—L. *Erythroxylon Coca.*

Cocoa Butter.—Chocolate.

Cocoanut Oil.—*Rogan narjeel; gari (khopre) ka tel.*

Cod Liver Oil.—Obtained from the fresh liver of the Cod, a fish in the North Atlantic Ocean, by steaming; useful in building up tissues during wasting diseases.

Coffee. *Qahwa* the reddish-yellow seeds of an evergreen tree grown in Abyssinia, Arabia, Southern India etc. The stimulating effect of coffee beverage due to an alkaloid-caffeine. *Cf Cocoa above.*

Coke.—When coal is heated in a closed vessel, coke is formed. It is used in the manufacture of iron and steel and in other metallurgical operations where vapours of ammonia or sulphur are injurious to the process.

Colchicum Daffodilla.—*Suranjan, Bajar qand.*

Colcothar.—A purple ferric oxide, residue from distillation of ferrous sulphate in the manufacture of fuming sulphuric acid ; used as polishing powder and as a colouring agent.

Collodion.—A gummy liquid obtained by dissolving gun-cotton in a mixture of alcohol and ether, the evaporation of the solvent leaving a tenaious film; used in photography and for coating wounds.

Colocynth.—Bitter apple, *kaura tumma, kaur-tumma, hanzal. Indrayan ka phal.* The drug prepared from peeled and dried fruit, a billiary stimulant and purgative. L. *Citrus Colocynthus. See Bitter Apple.*

Colophony.—Yellow or black rosin; the residuum of the distillation of turpentine; *sundras, resin.*

Columba.—A plant of Mozambique, whose root is used as a bitter tonic.

Colza Oil.—Rapeseed oil, used as lubricant, in making cycle lamp oil, in soap making. Oil cake used as food for cattle. *Karwa tel. Tare mire ka tel. Dhure ka tel.*

Common Salt.—Chemically sodium chloride but strictly speaking its composition is sodium chloride, 94·67%; sodium sulphate, 0·80%; pot chloride, 0·35%; mag. chloride, 0·45%; gypsum, 0·73%; water 2·90%. There can be variations according to the source from which it is obtained.

Concrete.—The mixture of sand, gravel or pieces of stone with lime or cement.

Condy's Fluid.—A disinfectant solution of crude sodium permanganate.

Conessi or **Telicherry Bark.**—L. Holarrhena Antidysenterica Wall. *Kurchi, Kaureya.*

Copaiba or **Copaiva.**—Sweet-smelling acrid balsam of the resin from a South American tree; oil used in gonorrhea: yellowish colour and bitterish pungent taste: popularly spoken of as *bahroze ka tel.*

Copal.—A resin, or gum, hard, brown or colourless, from Zanzibar, the produce of three or four different trees. It occurs in irregular lumps, of various forms and sizes. It is without taste or smell from a transparent white to a brown colour; it is scarcely soluble in alcohol alone unless by long-continued heat; it is soluble in ether, in alcohol when mixed with camphor; still more so in alcohol mixed with caoutchoucine and by particular management in naphtha and the oil of turpentine. It is used in making varnishes.

Copal Varnish.– This hard, clear and imperishable varnish, which is used so much for the bodies of carriages, cabinet work, etc., may be made as follows: Take hard copal 300 parts, drying linseed or nut oil from 125 to 250 parts, spirits of turpentine 500. These three substances are to be put in three separate vessels. The copal is to be fused, the drying oil heated nearly to boiling point and added, a small portion at a time, to the copal. When this combination is made and the heat a little abated, the essence of turpentine, likewise previously heated, is to be introduced by degrees. When cooled down to about the 130th degree Fahrenheit, they may be strained through a filter. This varnish improves by keeping. See also p. 157.

Copper.—*Tamra*, or *tamba*, a reddish metal, shining, tenacious, good conductor of heat and electricity, specific gravity 8·9°, melting point 1·083°, tarnishes on heating, gives green colour on burning, used for utensils, which must be coated with tin: for boiler tubes, for making wires, for fire boxes, for engraving, etc.

Copper Acetate.—Verdigris ; *Zangar.*

Copperas (Blue).—Iron sulphate or *kasees.*

Copperas (Green).—Ferrous sulphate or *hira kasees* used in ink making, in tanning and dyeing.

Copperas (White).—The crude iron sulphate.

Copper Plate Engraving.—(See Engraving).

Copti's Teeta.—*Mameeran.*

Coral.—*Moonga, mirjan.*

Cordite.—A smokeless, heating and damp-resisting propellent explosive, consisting of 58% nitro-glycerine 37% gun-cotton and 5% mineral jelly (mark I) used in cartridges and small arms in the British Army

Cored. —*Gudda nikala hua.*

Cordia. (sepistania); *sipistan, lahsoorian.*

Cordial.—*Mufarrah. See Elixirs.*

Coriander.—*Dhania, kashniz, kothmir*, fruit of an umbliferous plant, used as a spice and for making scented hair oil. The essential oil of coriandar is used in making confectionery, curries, and in manufacturing liquors. B. *Coriandum sativum.*

Cork.—The bark of the Quercus liber, a species of oak which grows abundantly in the southern provinces of France, Italy and Spain. The bark being stripped from the tree in the spring of the year is soaked in water, then pressed flat by the weight of large stones, next dried and afterwards somewhat charred on the surface by fire. The chief uses of cork are for stoppers of bottles, floats for fishermen's nets, as a buoyant material in lifeboats, preservers, etc., for the inner soles of shoes and to line the drawers in which collections of insects are preserved.

Corn or **Maize Oil.**—Oil from the Indian Corn *makka.*

Corrosive Sublimate.—Kapoor, mercuric chloride or bi-chloride of mercury, while, small rhomic crystals, formerly called the oximuriate of mercury. It is a most deadly poison and as such is used in a weak solution to wash over the plants in herbaria that they may not be subject to the attack of insects. It is also destructive to vegetable life, therefore a small portion added to blacking to inks, etc. preserves them from mould and other fungi; hence its solution is used to soak timber into preserve it from the dry rot. It is a most powerful antiseptic and animal bodies immersed in it have remained a great length of time so fresh and uninjured that no signs of putrescence were discovered in them. It is fairly soluble in hot water. Melting point, 288° C.; B. P. 303° C. made by heating mercuric sulphate, 5, with salt, 2, and then subliming.

Corrugated Metal.—Generally corrugated galvanised iron sheets. The corrugation increases the strength.

Corrundum.—*Kurand pathar.*—The native oxide of aluminium; an abrasive; the hardest mineral with the exception of diamond; can cut glass. Several varieties; ruby. amethyst, topaz, emerald, sapphire, common corrundum. or *Kurand pathar.* The last occurs in grains in sand, used for bearings in watches and other scientific apparatus. Emery is impure corrundum. Artificial corrundum can be made by melting bauxite in electric furnace.

Costus.—*Saussursa Lappa,* C. B. Clarke. *Kuth.*

Cotton Absorbent.—See p. 387.

Cotton Seed Oil.—*Binaulon ka tel.* See p. 48.

Coumarin.—An extract from tonka beans and ruffs, used in perfumery and in masking the odour of iodoform.

Court Plaster.—Made as follows: Black silk is strained and washed over several times with the following mixture: Dissolve half an ounce of balsam of benzoin in 6 ounces of spirits of wine; and in a separate vessel dissolve 1 ounce of isinglass in as little water as possible. Strain each solution, mix them and let the mixture rest so that any undissolved parts may subside; when the clear liquid is cold, it will form a jelly which must be warmed before it is applied to the silk. When the silk coated with it, is quite dry, it is to be finished off then with a solution of 4 ounces of china turpentine in 6 ounces of tincture of benzoin.

Comitch.—*Kaunch.*

Cowhage.—L. *Muouna Pruriena,* Dc. *Kamach, Alkus.*

Crab's Apples.—*Jangli seb.*

Crab's Eyes.—A preparation of calcium carbonate.

Crackers.—Fireworks which when fired go off with several small explosions.—They are made in a long case formed of three or four thicknesses of paper rolled round a long wire and pasted at the outer edge; then loosely filled with gunpowder folded up in short alternate doublings and tied very tightly in the middle around each doubling. When fired, the various doublings inflame in repeated succession.

Cress Seeds.—*Chandrasoor, Hubalrashid, Halu maide.*

Croton.—*Jamal gota, Hubal salaten.*

Crayons.—Slender, soft, chalk-like pencils, used by the artist for sketching upon paper. The hard, black crayons, called French crayons, are made of charcoal, cut into slips, and afterwards soaked in hot wax. Other crayons are made of various coloured powders, united together by different cements, of which the following is recommended:—6 parts of shellac, 4 parts of spirits of wine, 2 parts of turpentine; to which quantity of ingredients are to be added 12 parts of the colouring matter, and 12 parts of the blue clay.

Crayons, Lithographic.—Mix together by a gentle heat, white wax 4 parts, hard tallow soap and shellac, each 2 parts, hard tallow lamp black, 1 part. It may be cast into moulds for use.

Cream of Tartar.—Potassium hydrogen tartarate, acid tartarate of potassium, is made by digesting purified tartar powder, 10, with crude hydrochloric acid, 1, for several hours, filtering and washing, and finally drying. See also Part I, p. 384.

Crocus.—*Kasumba*. Cultivated for bautiful flowers.

Creosote.—A colourless corrosive limpid, strongly scented liquid, obtained in the distillation of coal-tar; oily liquid; distillation product of wood tar, chief principle being guaiacol, used in medicie for respiratory diseases; highly antiseptic. Distinguish from creosote oil extracted from coal tar for preserving timber.

Cresols.—Methyl phenols, obtained during destructive distillation of coal, used as antiseptic.

Crude Creosote.—Tar oil.

Crystal.—Any solid body which has assumed a regular and determinate angular form. Crystals are either natural or artificial; the natural crystal is one that is formed without the intervention of human art, and which cannot be otherwise thus formed. The artificial crystal is such as may be manufactured, though the particular forms that even these last assume are no less subject to natural laws. Natural crystals are seen in numerous gems, quartz, metals, and minerals. Artificial crystals are exemplified by chemical salts, sugar, etc. The forms that crystals assume are almost endless, though each, with a few exceptions, remains constant to one appearance.

Crystallisation.—The process of a solid separating from a liquid or gaseous composition into regular geometrical shapes, having plane surfaces. Crystallisation is accelerated by saturating the solution. If the saturated solution is allowed to stand still, bigger crystals may be had. Sometimes crystals form round a piece of foreign matter. Thus it is that very big crystals ot sugar collect round pieces of thread in making crystalline sugar-candy of *Kalpi* or *sitta* type. Small

sugar crystals separate out by means of centrifugal machine. Most crystals are made by natural forces.

Crucible.—Clay pots of a special type, for heating metals at a high temperature. The unglazed pots of this description are known as *Kuthalis.*

Cubeb.—*Kabab cheeni; seetal cheeni; Kankol.* Pepper-like small black seeds.

Cucumber.—*Kheera.* For uses see pp. 194, 390, 121.

Cumin or **Cumin Seeds.**—*Zirah sufed;* several varieties. Kashmiri cumin highly aromatic and used for flavouring *pulaos* and in cookery as spice. White cumin of Delhi variety is also the next best aromatic type. Used as carminative, especially in what is known as *Zire ka pani* and in making *churans.* B. Cuminum cyminum.

Cupric Chloride.—Obtained by heating copper or cuprous chloride in excess of chlorine.

Curcumin.—Turmeric yellow.

Currant.—*Zarishk, giddar dakh.*

Curd.—*Dahi, jugrat, Bengali, Dohi.*

Curry Powder.—See p. 126.

Custard Apple.—*Shareefa, seetaphal.*

Cyanida.—A metallic salt of hydrocyanic or prussic acid. Potassium cyanide used in the extraction of gold.

Dammar Rosin.—For explanation see Part I.

Dandelion.—L. *Taraxacum Officionale,* Wiggers.

Datura.—A plant of the potato family. Datura stramonium cultivated in England and native in some parts of India for its seeds and leaves, a tincture and extract made from the former. Dried leaves used in making Grimault Cigarettes for asthmatics. All parts narcotic and in big doses deadly poisonous.

Daturine.—An alkaloid obtained from the datura stramonium.

Dehydrated.—Anhydrous, which see.

Deadly Nightshade.—See Belladonna.

Decantation.—The process of taking off the pure liquid when the suspended impurities have subsided.

Decoction.—The operation of boiling; also the liquid which by boiling has been made to dissolve and imbibe any substance boiled with it.

Decolorising.—The process of doing away with the coloured impurities in sugar refining, etc., by means of animal charcoal, lime, potassium permanganate, whiting of egg, or sulphuric acid.

Decomposition.—The separation from each other of the constituents of a compound body; thus atmospheric air decomposed gives out oxygen and nitrogen. Decomposition may be occasioned by chemical action, however such action may be produced, whether by mixture, heat, light, electricity, &c. Hence we speak of electrical, chemical, and other decompositions. If one body or compound is alone acted upon, the decomposition of it is called simple; but if two substances act upon each other, so that they are both separated into their elements, and these elements again unite in any different manner, so as to form substances of properties distinct from the first, the decomposition is called double. The former arises from simple or single affinity; the latter from double affinity or attraction.

Deliquescence.—The absorption of liquid by a substance, *e.g.*, calcium chloride becomes liquid by absorbing water vapour from the air. See next.

Deliquescent Bodies.—Bodies having the power to absorb moisture from the air are themselves known as Deliquescents.

Distinguish these from hygroscopic substances, *e.g.*, glass, steel, etc., on which moisture condenses when they are sufficiently cold; from dehydrators which absorb or remove moisture from the bodies coming in contact with them. Most dehydrators are, however, deliquescents. **Examples:** Suphuric acid, calcium chloride, caustic soda and potash. Deliquescence is the opposite of efflorescence. Whenever the vapour pressure on the surface of a hydrator is greater than atmospheric pressure, it will lose water; on the other hand whenever the vapour pressure is less than the atmospheric pressure, there will be a tendency of atmospheric vapour to get into the body in question.

Whenever both these pressures are equal, there will be no change and the body will then be called stable. This phenomenon is, however, greatly influenced by temperature and wetness (humidity) in the air. Thus salt and sugar are stable in winter but in rainy weather they too absorb moisture from the air; more so *Jaggery* or *Gur*.

Zinc sulphate, magnesium sulphate, sodium sulphate, are examples of efflorescent bodies. Keep both, the deliquescents and the efflorescents, in well-stoppered bottles.

Denaturant.—Substance that being dissolved in alcohol makes it unfit for human consumption.

Depilatory.—A hair-removing agent (see p. 189.) the best being electrolysis. The milk of *ak* or madar plant satisfactorily removes the hair of skin and holds out possibilities of being turned into an organic toilette depilatory in place of barium sulphide.

Derby Red.—Basic lead chromate.

Desiccation.—Slow elimination of watery elements from a mixture by gentle heat or by placing the thing in a desiccator, or by means of hygroscopic chemicals, *e.g.*, calcium chloride, sulphuric acid, being placed alongside in separate vessels in an air-tight chamber, or by exhaustion of water vapour from the receiver of an air-pump in which the substance is placed.

Detonating Powders.—Certain chemical compounds, which on being exposed to heat or friction explode with a loud report. Of this description are gunpowder, the fulminates of gold, silver, and other metals. Common detonating powder may be made by triturating in a warm mortar, 3 parts by weight of saltpetre, 2 of carbonate of potash and 1 of flour of sulphur. When thoroughly mixed together, a little of the mixture may be put in a laddle, and if allowed to be gradually subjected to friction it will explode with a terrific report.

Devil's Cotton.—B. Abroma augustus; *Ulat Kambal.*

Dextrine.—A carbohydrate obtained (1) from starch by heating to a temperature of 140°C. until it is of a light brown colour, or (2) by the action of dilute acids (usually a mixture of dilute nitric and hydro chloric acids) on starch, the mass being heated to 160°

to 120°C. Yellowish powder, peculiar smell, soluble in water, and in dilute alcohol, converted into sugar dextrose by boiling with dilute acid, optically dextrorotatory, commercial dextrin known as "British" gum, used to thicken inks.—For further particulars see Part I.

Dextrose.—See Glucose. Also p. 18.

Dhavi Gum.—L. Anogeissus Latifolia, Wall.

Diastases.—Enzymes present in malt, barley, etc., and calculated to change insoluble starch into soluble sugar. The saliva of mouth also contains this enzyme and helps converting the starch of the food into sugar, whence bread tastes sweet on being thoroughly chewed. Very important in brewing, alcohol industry, bakeries, etc. For further particulars, see p. 17.

Dialysis, The process of separating a liquid or solution into its components by allowing it to pass through a membrane or other porous substance. Substances quickly passing through the membrane into water outside are known as Crystalloids, those doing so slowly or not at all Colloids. Beetroot sugar separated in this way.

Diamond. The hardest mineral and crystalline variety of carbon, existing in single crystals, generally octahedral in form, the rarest variety looking like clear glass, others variously tinted. Diamond alone can cut or scratch another diamond. Impure crystals and pieces, called Bort, are used for engraving and polishing perfect stones, small fragments employed in watches. Artificial diamonds in very small pieces can be made.

Diuretic.—*Peshabawar*, e. g. nitre.

Digest.—To subject a substance to the slow action of a solvent for saturation. Cf. Maceration.

Digester.—A kind of boiler for raising water to a higher temperature than the boiling point, 212° F., or 100° C. This consists of a closed saucepan with a tightly fitting cover and a safety valve. It was invented by Papin.

Digitalis.—Foxglove. The leaves of foxglove; tincture stimulates the heart and contracts the arteries, action being due to three principles—digitoxin, digitalin, digitalein. B. Digitalis Purpurea.

Dill Seed.—Soya; sulfa. L. Paucedanum Graveolens.

Disinfectants.—Substances like carbolic acid, formaldehyde, potassium permanganate, that destroy the bacteria and prevent the spread of infectious diseases.

Distemper.—Process of painting by mixing with the colouring matter substances that impart proper consistency, drying qualities, adhesiveness, *e.g.*, wax, whiting of egg, gum, size, resin, glue. In fresco no distemper is used. In tempers, the solvent is water. When pigments are toned by whiting and tempered with size, it is called distemper. Used by scene painters and painters of walls.

Distillation.—The process of separating a liquid in pure form from its mixture by evaporation and condensation. *Amal-i-taqtir, kashid karna..* The vessel in which the mixture is boiled is called still, retort, *bhabka.* The condensed vapour. is called distillate. The vessel in which the distillate collects is known as receiver. In case a liquid decomposes at its boiling point, the distillation is carried on in a vacuum pan under reduced pressure—this accelerates the distillation.

Distillation, Fractional.—When one of the liquids in a mixture boils at a lower temperature, it can be separated by changing the receiver before the boiling point of the other liquid is reached, and purified by redistillation, *e.g*:, alcohol and water.

Destructive Distillation.—When a substance is composed of volatile elements, the latter will decompose on being heated. Such a process is known as destructive distillation. Used in making wood, alcohol, acetic acid, coal gas, and in shell motor spirit.

Ditabark.—Alstonia Scholaris, R. Br. *Chhatim*

Dodder.—*Amarbel.*

Dolomites.—Caleium and magnesium carbonates, pearl bitter spar, large rock masses; crystals transparent or transluscent, and hexagonal. Houses of Parliament made of this stone.

Dona.—L. Artemisia, *Mustaira.*

Dorerrema Ammoniacum.—*Kandoori.*

Dough.—Thick viscid paste, *gundha hua ata.*

Drachm.—*Diram*, about one *masha.*

Dracophal.—*Belingo, Tukham malangan.*

Dragon's Blood.—A red resin exuded by a type of trees in Sumatra, and the West Indies, used for colouring or staining varnishes. Ver. *dhoona lakh.*

Drying Agents in Paints.—Litharge, red lead, manganese dioxide, combined with or without asphaltum and pitch.

Drying Oils.—Mohwa oil, turpentine terebene, ground nut oil, linseed oil.

Dry Rot.—See Rot, Dry.

Dryobalomp aromaticum, *Bheemsaini Kapur*

Ductility.—Power of extension and of being drawn out into wires, possessed by most metals, e. g. gold.

Dudhia.—L. Euphorbia Pilulifera, *Khirni*

Dutch Gold.—An alloy of copper and zinc, of no certain proportion but containing more of the former metal than exists in brass. See Part I.

Dutch Liquid.—Ethylene chloride.

Dutch Metal Leaves.—For composition, see p. 312.

Dyeing.—The art of dyeing consists of fixing upon cloths of various kinds, silks, wool, marble, etc., any colour that may be required, in such a manner as that they shall not be easily altered by those agents to which the cloth will most probably be exposed. See p. 79.

Dyne.—Absolute unit of force, that acting on one gram will give an acceleration of 1 cm. per second.

Dysmodium.—*Gngalicum.*

Eagle or Aloe Wood.—B. Aquillaria Agallocha, Roxb. *Agaru*; *Ud*; *Ud gharaqi.*

East Indian Arrowroot.—B. Curcuma Angustifolia, Roxb.

Eau-de-javelle.—Solution potassium hypochlorite.

Eau-de-larraque.—Solution of sodium hypochlorite

Eau.—A French word, signifying water, etc., used in English with other words, for several spirituous waters, particularly perfumes, as eau de Cologne.

Ebonite.—Vulcanite; rubber mixed with sulphur. For manufacture of Ebonite, see p. 241.

Ebony.—The black heart wood of certain trees in Ceylon and Mauritius, Madagascar; *abnoos*. For Imitation Ebony, see Part I, Chapter XVIII, p. 242.

Ebullition.—Boiling.

Eclipta prostrata.—*Bhangra.*

Effervescence.—Escape of gas from a boiled or heated liquid.

Efflorescence.—The crumbling into powder of a crystalline substance and thereby giving up its water of crystallisation, *e.g.*, washing soda; opposite of deliquescence.

Egg Cement.—Mix the white of eggs with quicklime powdered to the consistency of a thin paste and apply it to broken china glass, etc., the pieces of which it will unite with considerable strength.

Egg Varnish.—(See Glaire.)

Elaidine.—A solid substance formed by shaking olive oil mixed with 3 per cent of nitrous and 9 of nitric acid; after resting an hour it becomes concrete or is converted into elaidine.

Elasticity.—The power of a substance resuming its previous volume or shape after the force applied has been taken away.

Electroplating.—See Chapter IX in Part I, p. 96.

Electric Alarms.—Rung on the principle of the circuit of voltaic electricity being completed which continues to ring the bell. Fire alarm rings on the mercury in a tube expanding and completing the circuit.

Elements.—*Anásar, tatvas.*—The simplest material bodies which by the known chemical methods have not been split up into simpler bodies. 87 elements have so far been discovered.

Elemi.—A resin which exudes from the *amuris elemfera*, a tree of South America. It is yellow, comes in small lumps, is strongly aromatic, and is of a spicy

taste. It is used by the varnish maker and in making lacquer.

Elephant's Foot, Zamin qand.

Elixir.—A tincture extracted from many ingredients, whereas a simple *tincture* is extracted from only one. *Al akseer*; *mufarrah*; *yaqooti*; something like *sanjeevni booti*. See Part I, pp. 128, 269, 298, 392, 394.

Elixer, Universal.—An object endeavoured to be discovered by the alchemists was to find an universal elixir or a medicine that would cure all diseases.

Emerald.—A precious mineral and precious stone of beryl variety, one of the softest precious stones; colour beautiful green. Oriental emerald is green corrundum. Ver. *zamurad*; *sabzah*; *zabarzad*; *panna*.

Emblic Myrobalan.—L. Phyllanthus Emblica, *Amlaki, Aonla, Amla.*

Embelica.—*Baobarang,*

Emery.—A hard mineral of a dark grey colour. It is dark and opaque. The best is obtained from the island of Naxos in the Mediterranean. The extreme hardness of this substance has caused it to be employed in various arts such as polishing precious stones, grinding glass for brightening and cleaning iron utensils and generally as a grinding and polishing powder. It is impure aluminium oxide or corrundum (*q.v.*)

Emelic Nut.—*Mainphal, madanphal, jauzalqal.*

Emetics.—Substances that induce vomiting, *e.g.*, salt water, mustard, tartar emetic, copper or zinc sulphate, ipecacuanha; *dandana*, juice of house-flies.

Emetine.—The peculiar principle of ipecacuanha root.

Emulsion.—An intimate mixture of oil and water by means of a mucilage, yolk of egg, milk almonds, etc.

Enamel.—A vitreous or glossy substance, used as shining protective on porcelain, clay, or metallic surfaces, for decoration or for prevention from attack by acids, etc.

Enamel Paints Leave a glossy surface on being dry.

Endive.—Kásni.

Enzymes.—Colloidal substances of catalytic nature produced by the active parts of animals and vegetables. Composition not yet definitely known. Soluble in water ; destroyed by heat under 100° C. A microscopic quantity of enzyme can produce rapid change in a very big mass. Thus invertase, an enzyme in yeast, can convert 200,000 times its weight of sugar into fructose and glucose. See also Diastase, above and in Part I, p. 17.

Epsom Salts.—Magnesium sulphate, a mineral obtained from German sea salts ; a much used valuable saline purgative, used for warp sizing and in textile manufacture.

Essence of Bitter Almonds.—Benzaldehyde, can be obtained from kernals of peach stones also ; now made artificially.

Essence of Mirbane.—Nitrobenzene.

Essential Oils.—Such oils as are volatile and are generally obtained by the distillation of the herbs and seeds which afford them.

They are fragrant, very inflammable, soluble in a very small degree in water, but in any proportion in spirits of wine. They evaporate at a degree of heat a little above that of boiling water. They leave no oily stain on paper and are decomposed with violent inflammation by the addition of nitric or sulphuric acid. The following three kinds may be obtained by expression :—Lemon, orange, and bergamot. They are acrid, and limpid.

Esters.—Pleasant fruit smelling liquids used as flavouring.

Esparto Grass.—A native of N. Africa, a tall grass, used in manufacturing paper. Vast possibilities for India.

Exsiccate.—To dry up.

Etching.—The art of printing pictures by means of a metallic plate on which a drawing has been made by scratching with a needle. See also Part I, pp. 105, 248.

Etching on Stone.—A species of lithography, by which fine-lined etching on metal are well limited. It is performed thus :—The stone being prepared with a smooth, clean surface, as in lithography, it is covered

with a coat of gum water, blackened with lamp-black; when dry, the etching is made with a needle, which, scratching through the ground, lays the surface of the stone bare. Linseed oil is now washed over the whole. This adheres to the bare lines only, and the black gum ground being washed off as soon as the oil is dry, leaves that to receive the ink used in printing.

Ether.—A colourless volatile liquid with peculiar smell and taste, made by distilling fixed amount of alcohol and ether with sulphuric acid, by 35° C.; dissolves carbon compounds; used as anæsthetic; *Nafee's Sat-i-sharab.*

Ethyl.—A supposed compound of alkyl radicle, base of ethyl series.

Ethyl Chloride.—A sweet smelling, volatile liquid, used as local anæsthetic. Manufactured by mixing a small quantity of zinc chloride in alcohol and passing into it hydrochloric acid gas. As vapours arise on application of heat, they are condensed in a receiver kept in freezing mixtures. Used in drugs and dyeing, as a refrigerent and solvent.

Eucalyptus or *Blue gumtree.*—A native of Australia, growing to a height upto 500 feet. Plantation supposed to reduce malaria in marshy areas. About 150 species. Eucalyptus rostrata yields a red gum, used as an astringent. Eucalyptus globulus yields an essential oil, used as an antiseptic, for inhalation, for stomachic, and for lowering temperature. now widey cultivated in Indian gardens. *Sama abeez ; neel gond vriksh.*

Evaporation.—Change of a liquid into the gaseous state. Rate of evaporation dependent upon:—(1) area of surface—larger the surface, the quicker the evaporation; (2) quantity of vapour in space above exposed surface; (3) external pressure—reduced pressure quickens evaporation; (4) on temperature—higher the temperature, the more rapid the evaporation. In evaporating sugar syrup in refineries, the vapour pressure is reduced by air pump. In multiple-effect evaporator, the liquor at reduced pressure is heated by steam, which on liberation is taken into another vessel containing the liquor at a still more reduced pressure, and so on.

Euryale.—*Makhana.*

Everitt's Salt.—Potassium ferrous ferrocyanide.

Evolvus. or *Samkha Mooli.*

Extract.—The concentrated juice of a plant.

Extracts.—Products obtained by soaking or boiling vegetable substances in such a solvent as will dissolve a certain portion of them, which portion is called the extractive principle. This is sometimes only in one or in several solvents, sometimes only in one or two. From the nature of the solvent used, the extract is either aqueous, oily, or spirituous. Spirituous extracts are often called essences. Extracts are generally thicker, and contain, proportionably, a much greater quantity of vegetable extract than infusions or decoctions.

Explosives.—Mixtures or compounds that on the application of heat expand into gaseous form instantaneously and form so large a volume as to cause detonation, *e.g,* gunpowder, nitroglycerine, picric acid, potassium chlorate, mercuric fulminate, ammonium nitrate, dynamite. Dynamite is made by absorbing nitroglycerine in kiesulguhr, which see below.

F.—Fahrenheit (thermometer scale).

Farinaceous foods.—Include seeds of cereals like wheat, oats, maize, rice, legumes, *e.g.*, peas, beans, lentils : tubers, *e.g.*, potato, arrowroot, tapioca, sago, carbohydrates and so heat producers ; excess of these taken stored as fats ; digested only in intestines.

Fehling's Solution.—Double tartarate of sodium and potassium, made by mixing solution of cupric sulphate, with Rochelle Salt.

Felspar.—Potassium aluminium silicate.

Fengureek.—*Methidana* ; *halbah. Faljiqan :* a leguminous plant.

Fennel.—L. Foeniculum Vulgare, Caertn, *Saunf, Panmouri.*

Fermentation.—The changes which dead animal or vegetable matters spontaneously undergo when subjected to warmth and moisture, all arise from fermentation ; and according to the result and product of those internal changes, so the kind of fermentation

is indicated. If gluten, sugar, and water be mixed in certain proportions, and assisted by a proper degree of heat, they will pass into the vinous fermentation, and a spirituous liquor, will be the result. If gluten unduly abounds, or the heat be too strong, or the process too long continued, it passes into the acetous fermentation, becomes sour, and vinegar is formed. Many things enter at once and very rapidly into the acetous fermentation. The heat exhibited by hay-stacks and similar collections of vegetable matter, is produced by the bituminous fermentation; so also is the formation of peat, and probably coal. Grain when malted, becomes sweet, because of the saccaharine fermentation. Bread is rendered light and spongy by fermentation; and finally, all matter whatever, finally decays. If, as in the case of animal flesh, it becomes putrescent, it is because it has passed into the putrefactive fermentation. Fermentation is Nature's way of resolving bodies no longer wanted into their constituents.

Fern.—*Parshaoshan.*

Ferri Perchloride.—Produced by dissolving iron in hydrochloric acid or passing a current of dry chlorine over iron wire.

Ferro-Cyanates.—*more properly Ferro-Cyanides-* are Compounds of the ferrocyanic acid and various bases.

Ferro-Cyanic Acid.—An acid of peculiar properties, formed of the cyanic acid and iron, which although apparently a neutral salt yet will unite with the usual bases, and form with that a class of double cyanides, which are quite distinct in character from the simple cyanides, formed by the action of the cyanic acid.

Ferro-manganese.—An alloy of iron and manganese, prepared by reducing the oxides with carbon in blast or electric furnace, used in making steel. Composition manganese 30 to 60%; carbon 5 to 6%; remaining iron.

Ferro-prussiate.—Potassium ferrocyanide.

Ferrous Sulphate.—Green vitriol, sulphate of iron, copperas, *hira kasees*; *Kahi.*

Ferruginous.—Containing iron.

Ferula.—*Heenga ka drakht.*

Fibrin.—A peculiar organic compound, found both in animals and vegetables. It may be procured by heating fresh blood with twigs. Fibrin soon attaches itself to each stem, under the form of long reddish filaments, which become white by washing them. It is solid, white, insipid, without smell, insoluble in water, softens in the air, becomes viscid, brown, and transparent.

Filteration.—The process of removing suspended impurities from an impure or muddy solution by means of filter paper, cotton, wool, sand, glass powder, charcoal, felt, etc.

Fire Brick.—A very hard kind of brick made of a particular species of clay, which resists the strongest action of a fire, therefore used for the lining of furnaces, and other similar purposes.

Firebricks.—Made from certain fire clays found in coal measures. They contain very small quantity of soda, potash or lime, and can withstand high temperature without fusion. Carborundum mixed with clay forms an excellent protective coating for firebricks.

Fires, Coloured.—Those beautiful and coloured parts of fire-works, which present a peculiar and vivid colour, different from that produced by the ignition of the gunpowder to which they owe their strength. They may be either in the state of flame, or a glowing fire. Coloured flames are produced by setting light to spirits of wine, in which one or more of the following substances have been dissolved. For *crimson*, nitrate of strontium; *blue*, nitrate of barytes ; *a sickly yellow*, common salt ; *a lemon colour*, raspings of amber ; *russet*, crude antimony ; *bronze red*, use Greek pitch ; *green* is produced by verdigris ; *pale white*, by camphor ; *strong silver white*, by raspings of ivory. Sulphur dampened with alcohol burns with a ***bright blue.***

Fixed White.—Barium sulphate.

Flash Point.—The temperature at which the vapour of an oil will catch fire. Flash Point of petrol is 14° to 18° F.; of Benzene 32° F. ; of paraffin oil 73° F. ; of fuel oil 50° to 190° F. ; of lubricating oils 230° or upwards.

Fleewort.—Seed of *eesabgol.*

Flint.—*chaqmaq.*

Flowers of Sulphur.—Sublimated sulphur, *phool gandhak.*

Formaldehyde.—A gas produced by acting formalin on a solution of pot. permanganate.

Fluorescence.—Self-luminosity in certain bodies like fluor spar.

Fluorine.—A most energetic halogen and an irritating gas. Hydrofluoric acid made by heating fluor-spar with sulphuric acid.

Fluor-spar.—Fluorite, or calcium fluoride, made into vases and ornaments, met within tin, lead, granite, or slate mines, in Derbyshire, etc.

Flux.—A chemical to help fusion by heat.

Formalin or **Formaline.**—Prepared by condensing the vapour of methyl alcohol mixed with air over heated copper. It has pungent smell. At ordinary temperature a gas. Commercial formalin 40% solution in water. Used as antiseptic, preservative and deodrant.

Formic Acid.—A fatty acid, prepared by distillation from oxalic acid and glycerine or passing carbon monoxide under pressure into caustic soda ; the sodium formate so formed then being acted upon by sulphuric acid is cooled. It was formerly obtained from oats.

Fossil Earth.—*Shor-i-zamin, reh.*

Foxglove.—See Digitalis.

Frankincense.—An aromatic gum resin from conifers, like olibanum ; colour yellowish brown, taste aromatic and bitter ; odour balsam like ; insoluble in water ; burns with a white flame. Used as an incense. *Loban.*

Freezing Mixture.—Best example salt and ice; solution of solid carbon dioxide and ether or chloroform will produce a temperature of—77° C.—See also p. 132.

French-beans.—*Frashbeen.*

French chalk.—A variety of talc.

French Polish.—Can be made by dissolving shellac in methylated spirit. Addition of Bismarck brown will give red polish.

Frit.—The calcined mixture of glass.

Fruit Sugar.—Fructose.

Fuchshine.—Rosaniline : an aniline colour.

Fuller's earth, *Shor-i-zamin, kallar, reh:* a greenish clay from England, with unctuous feel; does not adhere to the tongue, nor yet form a plastic paste with water; has the power of strongly absorbing greasy matter, and as such of cleaning woollen goods: hydrous silicate of ammonia; formerly used for cleaning wool; now for purifying vegetable and mineral oils; incorrectly called *sajji mitti.* True Fuller's earth almost corresponds to China clay, though both differ in composition. The latter is extensively employed as a substitute for fuller's earth; chemically it is aluminium silicate.

Fulminating Mercury.—Mercuric fulminate.

Fulminating Powders, or *Fulminates.* Highly detoning compounds of gold, silver, mercury, and formed by acting upon their nitric solutions by alcohol, in some cases by ammonia.

Fumamia Parviflore, *Pitpapra; shahtara.*

Fuming Sulphuric Acid.—Naurdhausen sulphuric acid obtained by calcining iron sulphate, and gradually exposing it to a red heat in a retort.

Fusel Oil.—Mixed amyl alcohol; present in low grade spirits; made during fermentation of alcohol; used in preparation of amyl acetate for solvent and flavouring purposes; also used for making varnishes.

Fusible Alloys.—Alloys that melt at a temperature lower than boiling water, *i.e.*, 100° C., *e.g.*, Rose's Fusible metal contains tin and lead each 1 part, bismuth 2 parts, melts at 92° C. Wood's Fusible metal (tin and cadmium each 1 part, lead 2 parts, bismuth 4 parts; melts at 60·5° C. Used in fire-alarms and in safety plugs in boilers and in automatic fire-extinguishers. In the last the rise of temperature melts the plug and lets loose the water at high pressure.

Fusible Metal—or **Alloy.**—Darcey's Alloy. Newton's Fusible Metal. An alloy which melts in the heat of boiling water. It is composed of 3 parts by weight of tin; 5 of lead; and 8 of bismuth.

Galangal—*Kulanjan, Khaulanjan.*

Galbanum—*Heeng ki tarah ki ek badboodar gond*; the juice of bubon galbaniferum.

Galena.—Native lead sulphide, *surma, anjan.*

Gallic Acid.—Prepared by heating its glucoside tannin with dilute acid; constituent of gall nuts; a powerful reducing agent; on being heated to 215°C.; yields pyrogallol; is obtained by moistening bruised gall nuts and exposing them for four or five weeks to a temperature of 80°. The mouldy paste thus formed should be squeezed dry and digested in water. The solution being bleached with animal charcoal gives gallic acid.

Gall Nut.—A round, nut-shaped excrescence, common to the oak and occasioned by the puncture of an insect. The gall nuts of commerce are hard, woody, and heavy. In medicinal qualities powerfully astringent, and are much used in the arts of dyeing and ink making. In chemistry, their solution is used as an excellent test for iron, precipitating it of a purplish black colour. Allepo galls are the best. Next come the Chinese galls. For ink-making choose greenish galls without punctures.—*See also* Galls *below.*

Gallipoli Oil.—An inferior kind of olive oil, imported from a port so named in Otranto in Italy.

Gallipot.—The name of a white, semi-solid, viscid rosin, found on fir-trees.

Gallipot Varnish.—Take 12 ounces of pounded gallipot; 5 ounces of white glass, pounded; 2 ounces of Venice turpentine; and 32 ounces of essence of turpentine. The only use of the glass is, to prevent the union of the small particles of gallipot with each other, it being necessary that this should be prevented, which is done by the glass intermixing with the other ingredients.

Galls.—*Maju.* Certain eggs deposit their eggs in the tissues of plants and at the same time inject some irritating poison. This swells and forms the galls. Wasps responsible for the formation of oak galls, used in ink-making. *Mayin* used as mordant in dyeing.

Galvanising.—The process of protecting iron sheets, etc., from rust by coating them with zinc. After the metal has been thoroughly cleaned and rubbed with sand, and pickled in sulphuric acid it is dipped in molten zinc.

Gambier, Pale Catechu.—*L. Uncaria Gambier Roxb. Chaka Khair.*

Gamboge.—A gum resin, the produce of the *garcinia gambogii*, a large tree indigenous to India, Ceylon, Siam, Cochin China and Cambodia. It is of a fine yellow colour, when diffused in water, and as such is much employed by painters in water colours. It is also used to stain wood in imitation of box and also marble; and as a colouring ingredient in lacquers and yellow varnishes. It is soluble in alcohol; a drastic purgative.

Garjan Balsam.—*Dipterocarpus Turbinatus. Garjan Oil.*

Garlic.—*Lahsan, thom.*

Garnet.—A gem of a dark red colour, of which there are two kinds; the precious garnet and the common garnet. The garnet is often of a brownish green colour, and used by lapidaries as a polishing powder.

Gas.—The name of every parmanently-elastic aeroform substance. Gas is distinguished from steam or vapour by this circumstance, that vapours are raised from all fluids by heat, and are again condensed by cold into the same fluid form; but gases are obtained from the substances containing them only by chemical decomposition, whether this be spontaneous or artificial. They are either not condensable, or only so when submitted to an excessive pressure or degree of cold. Four of the gases are simple substances, oxygen, hydrogen, azote, and chlorine. The rest are more or less compound, as carbonic acid gas is a compound of oxygen and carbon; sulphurous gas of sulphur and oxygen, etc. Gases are mostly colourless; nitrous acid gas, however, is red; chlorine and its proto and deutoxyde are of yellowish green; the hydrochloric, hydriodic, fluoboric, and fluo-silicic produce white fumes in the air, and iodine violet coloured fumes when heated. The gases which are inflammable are hydrogen and all its

compounds; carbonous oxide, and cyanogen. Those which more or less support combustion are oxygen, protoxide of azote, chlorine, and its oxides. Some gases are destitute of smell: others have an odour which is insupportable, and often characteristic. In properties numerous of the gases are acid; some neutral; two alkaline.

Gas or Coal Gas.—Manufactured by the destructive distillation of coal in special retorts.

Gas, Coal, Oil, and Rosin.—The carburetted hydrogen extracted from bituminous, fatty, or resinous substances, and which is so extensively employed for purposes of illumination; each kind different very slightly from its other, and having different names merely on account of the material employed. The manufacture of coal gas may be stated as follows:—Any kind of coal which contains much bitumen is put into a retort; several retorts, about three parts filled, are placed in a furnace, and a strong fire kept up around them. Each retort is furnished with a small pipe, to convey into a larger pipe the impure gas which the coals in the retorts give off. This pipe conveys it into a cistern of water, where the tar and the grosser impurities are retained. The gas passes on to the purifying vessel, which is filled with lime water, or rather with lime so mixed with water as to form a cream-like fluid, called therefore cream of lime. From this vessel it passes to a gasometer, where it is stored up till wanted for use, when it has to pass through the hydraulic valve, the gas, governor, or where this is not used, the gas regulating valve, the main, the branch pipes, and burner; the gasometer when used being placed near to the burner, if for registering individual consumption; or near the gasometer, if the whole quantity used is to be ascertained.

When gas is made from oil, the retorts are filled with broken bricks, coke, or other refractory substances which becoming red hot, the oil is allowed continually to trickle into them, when it becomes decomposed. Gas of similar properties may be made from peat, wood, dry vegetables, sawdust, etc., though being contaminated with much carbonic acid, such gas requires greater care in its purification.

Gasolene.—Petrol. Volatile inflammable liquid obtained in distilling petroleum, used for heating, lighting, cleaning.

Gearing.—An arrangement of wheels, belts, or chains by which power or motion is communicated from a driving wheel to the driven wheel.

Gelatine.—A compound of carbon, hydrogen, nitrogen and oxygen, obtained by digesting bones, tendons, skins, with superheated rollers, in sizing, and with potassium bichromate in photography. Ver. *Musaffa suresh.*

Gentian.—*jintiana, pakhan bed; páshan bed.*

Geranium.—A kind of rose.

German Chamomile ; B. Matricania Chamomila ; *Phul Babuna.*

German Silver.—An alloy made by fusing together 52 parts copper, 26 parts zinc, and 22 parts nickel.

Ghee.—Clarified butter. See Part 1, pp. 26, 132.

Gilding.—The art of laying gold on any surface by way of ornament. The art of gilding is performed, either upon metals, or upon wood, leather, parchment or paper. There are three distinct methods in general practice, namely, *wash* or *water gilding*, in which the gold is first mixed with mercury, then this amalgam is rubbed over the article, and afterwards the mercury is driven off by heat, when the gold remains ; this method is only applicable to metals. *Leaf Gilding*, either burnished, or in oil, is performed by cementing leaves of gold upon the work, either by size, or any oily varnish, called gold size. *Japanner's gilding*, in which gold dust or powder is used instead of gold leaf.

Gilding Metal.—An alloy composed of 4 parts of copper, 1 part of Bristol old brass, and 14 ounces of tin to every pound of copper. This alloy takes a fine polish, and as such is much used for common jewellery.

Gingele.—Same as *Til* or sesame.

Ginger.—B. Zingiber officinale, Rose. *Sonth Adrak, zanjbeel,* the dry ginger. Sonth, is obtained from the root of Zingiber officinale · agreeable aromatic

odour; pungent taste: used as stomachic, carminative, and in spicing and flavouring. See p. 127.

Ginger Grass.—B. Cymbopogon Schoeananthus, Stapf. *Khavi.*

Ginger Beer.—See Part 1, p. 357.

Glacial Acetic Acid.—This acid when it exists in a crystalline state, is as it does when pure, united to an exact quantity of water, and subjected to cold.

Glacial Phosphoric Acid—Is phosphoric acid mixed with a certain definite proportion of lime. When bones are dissolved in sulphuric acid and water, the result is two compounds: one a sediment of sulphate of lime, the other a transparent liquid. If the latter be evaporated, it yields a second sediment of the quadri-phosphate of lime, in the state of a white powder. Upon placing this in a crucible, it fuses into glassy scales, called glacial phosporic acid, or glass of phosphorus. It is this substance from which phosphorus is made.

Glacial Sulphuric Acid.—When sulphuric acid is made by the distillation of green vitriol, it is frequently observed that a portion solidifies into a white mass of radiating crystals. This has been called glacial or fuming sulphuric acid, and is supposed to be the acid in anhydrous state, or without water.

Glance Coal.—Anthracite (*q.v.*)

Glance Cobalt.—A sulpho-arseniuret of cobalt, an ore of cobalt, found in Funaberg in Sweden.

Glass.—An artificial transparent substance, made by fusing various salts and metallic oxides with silicious earths. There are several distinct species of glass at present manufactured. *Flint glass,* which is composed of purified white sand, or else flints calcined and powdered 100 parts; litharge or red lead 60 parts; pearlash 30 parts. *Plate Glass.* 300 lb. of fine sand; 200 lb. of soda; 30 lb. of lime; 2 lb. of magnesia; 3 oz. of cobalt azure; 300 lb. of fragments of good of glass. *Crown or best Window Glass* 300 parts of soda; 300 parts of fine sand; 33 parts of lime; 250 of fragment glass. *Green Window or broad glass*—11 lb. of dry Glauber salt; 10 lb. of soda; half a bushel of soap maker's waste; 50 lb. of sand; 22 lb. of glass pot skimmings; 1 cwt. of broken

green glass. *Bottle Glass.*—White sand 100 parts; kelp, from 30 to 40 parts; lixivated wood ashes, from 160 to 170 parts; fresh wood ashes, from 130 to 140 parts; potters clay, from 80 to 100 parts. *Cullet or broken glass* 100 parts. Glass for imitating gems. (See Pastes.) See Chapter X of *Industrial Encyclopædia.*

Glass Annealing Furnace.—An exceedingly long semi-cylindrical oven, with one, two or more large iron shelves, which extend and present an even surface from one end to the other. One extremity of the oven is heated to such a degree as nearly to make the glass red hot; the other extremity is open to the air, consequently there is a gradual diminution of heat throughout. The glasses to be annealed are placed in iron trays; each tray as it is filled is put into the hot end, the workman making room for it by pushing the other trays along the shelf. Having just before taken away the last tray from the cool end of the shelf, the glass in its passage through the whole oven will be submitted to the requisite heating and cooling.

Glass, Annealing of.—Glass when it comes from the hands of the blower is exceedingly brittle, and unfit to bear the sudden changes of temperature. To render, it more tough it is placed in an oven, where it is first heated, and afterwards suffered to cool very gradually, by which gradual cooling, called annealing, the purpose, is accomplished. See *also* Glass Chimneys, annealing of p. 110.

Glass Blowing.—The art of converting melted glass into the form requisite for the various utensils made from it. It is performed by the workman taking in hand a long hollow tube of iron, called a blow-pipe; dipping this into the glass pot, it will take up a portion of the melted glass or metal, as it is called by the workmen; then being withdrawn from the furnace, with the metal attached to it, the workman blows into the opposite end of the tube; the metal yields to the impulse of the breath, swells out like a bladder would under similar circumstances, and becomes a round hollow ball, which the workman fashions by rolling, pressing, and bending, while in a fluid state, into any required shape or size.

Glass, Coloured.—In coloured glass, the whole body of the material is tinged throughout by means of

some colouring ingredient uniformly diffused through, or dissolved in the substance of the glass. The following are the substances used at the glass houses: A blue colour is given by oxide of cobalt. Green by the oxide of iron or of copper. Violet by the oxide of manganese. Red by a mixture of the peroxide of iron and of copper. Purple by the purple oxide gold. White by the oxides of arsenic and zinc. Yellow by the oxide of silver. The colouring of glass in the manufacture is accomplished by adding to the melted glass in the glass pot a portion of the above ingredients.

Glass Drops.—(See Rupert's Drops.)

Glass, Frosting of.—The art by which glass is made to assume an opaque appearance. This effect may be produced in various ways: (1) By grinding it with sand and water, by means of a large cork held in the hand. (2) By the same materials while the article is turning in a lathe. (3) By submitting it to the fumes of fluoric acid and water. (4) By washing over it some semi-transparent substance, either common paste, a solution of gum tragacanth, etc. (See also p. 107.)

Glass of Antimony.—A brown glass-like substance, consisting of the protoxide and sulphuride of antimony, and made by roasting sulphuride of antimony over a slow fire till it emits no fumes, and then melting it in a brisk fire till it assumes the appearance of glass.

Glass of Phosphorus.—(See Glacial Phosphoric Acid.)

Glass, Painting of—Is of two kinds; in one the colours merely cover the surface, from which they may be afterwards removed, such as the painting of magic-lantern slides, and occasionally the glass of windows. This process is as simple as coloring upon paper; in the commoner kinds of it colours are rarely placed upon each other, in the better pictures the colours are blended according to the talent of the artist, the plate of glass upon which he paints being supported upon a frame with a strong light behind it, the effect being ascertained by looking through the glass. The colours used are all transparent and must be mixed with Poppy oil, mastic varnish, and turpentine or the two latter solvents. The following colours are suitable for the

purpose :—Prussian blue, verdigris, Indian yellow, the lakes, carmine, burnt sienna, umber, etc. The second method is by the aid of vitrifiable colours (see Glass Staining), which are burnt in, the outline being first sketched with turpentine mixed with Indian ink or umber.

Glass, Soluble.—A simple silicate of potash or soda, which unites with perfect solubility in boiling water and has some of the general properties of common glass.

Glass, Staining of—Is the communicating to glass a certain tint or stain, by laying a properly prepared liquid upon the surface, and afterwards submitting the glass to such a degree of heat as to occasion the liquid to penetrate into the texture of it, thereby staining it of a certain colour in such a manner that the stain cannot afterwards be removed Glass may thus be wholly covered, or only partially, exhibiting therefore in the latter case various devices, or a picture. All the preparations for this art contain silver in some form or other. A *yellow* is produced by equal parts of carbonate of silver and yellow lake; lay it on thin. In *orange*, take pure silver, in powder. 1 part; lay it on thin. For red, take of antimonial silver, prepared by melting together 1 part of silver and 2 parts of crude antimony, and pulverising the mass. 1 part: colcothar 1 part; lay it on thick. *Green* is formed by copper, in powder, 1 oz.; black lead 1 oz.; and 4 oz. of white lead, all calcined together; and then adding saltpetre one-fourth part. Azure, purple, and violet, are prepared in a similar manner to green, omitting the copper, and in its stead using sulphur for azure; perigneau for purple; and both these drugs for violet.

Glauber's Salts.—Sodium sulphate, transparent, colourless crystals, obtained by the action of sulphuric acid on sodium salts; used as purgative and as soda ash.

Glazes.—Fusible mixtures of felspar, etc., are either polishing or vitrifiable. The polishing glazes, and which are mostly attached to a lathe or revolving spindle are made of round pieces of wood, covered with buff leather, then with glue, and finally with powder, or

other similar polishing ingredients. These being prepared are made to revolve in the manner of a grindstone, and the article to be glazed is held against the edge. Glazes for glass are held against the edge. Glazes for earthenware are of various kinds. Common salt affords a cheap glaze for ordinary articles. Another common glaze is 10 parts of litharge and 4 parts of ground flints. Those recommended for fine work are : first, a compound formed by equal parts of lead and tin kept in fusion until completely oxidised ; second, calcined flint 8 parts ; ground porcelain 15 parts ; crystals of calcined gypsum 9 parts.

Glazing.—Has four distinct meanings. First, the process of placing the panes of glass between the frames of windows, doors, etc., where it is to remain. Second, the art of communicating a glass-like appearance to an article ; for example, pottery and chinaware, by means of a substance called a glaze. Third, the polishing of a metallic, wooden, or stone surface, by the friction against it of a polishing powder. Fourth, glazing in the arts signifies the overlaying or finishing of pictures in oil with brilliant and pellucid colours, intended to soften the painting, and by blending the colours before laid on to give it tone and harmony.

Glucinum.—*Berrylium.*

Glucose.—Dextrose, grape-sugar, found in sweet fruits, honey, etc., soluble in water but little in alcohol : prepared on a large scale by heating starch with dilute sulphuric acid. At first dextrine, then maltose, and then glucose is formed, the quantity of the last increasing with boiling. Used in manufacturing confectionery, jams, medicines, table syrup, and in brewing.

Glue.—Impure gelatine, *suresh*, is a popular adhesive. Bone glue is made by boiling bones, horns, after they have been freed from grease by petroleum. These are steamed in a cylinder with a false bottom, the trickled mass is clarified with alum in vacuum under pressure and concentrated to 30% dry glue. Then it is bleached by sulphur dioxide. Fish glue is obtained from the skins of fish. Good glue should soften and swell in cold water and dissolve in hot water. (See Part I, pp. 67, 68, 70, 328.

Gluten.—If wheat flour be made into a paste and washed in a large quantity of water, it is separated into three distinct substances; a *mucilaginous* saccharine matter, which is readily dissolved in the liquor and may be easily separated from it by evaporation; *starch* which is suspended in the fluid, and subsides to the bottom by repose; and *gluten*, which remains afterwards; it is tenacious, very ductile, somewhat elastic, and of a brown grey colour. From the flour of barley, rye or oats no gluten can be obtained, as from that of wheat. Maize or Indian corn is deficient in gluten.

Glycerine, Glycerol, Sweet Principle of Fats.—A colourless, viscid, neutral, inodorous fluid, of an intensely sweet taste, soluble in water and alcohol in all proportions, but is insoluble in ether and in chloroform, Sp. Gr. 1.3. Pure glycerine crystallises at 0° C. melts at 17° C., slightly volatile at 100° C, but on being distilled the greater part decomposes, but may be distilled without change in a current of super-heated steam; is found ready made in old palm oil and in all fermented liquors. *Uses*: medicinally in local applications in diseases of the skin and of the ear, is solvent for many drugs,; a valuable preservative for small and delicate anatomical preparations; preservative of meat; used in perfumery, in calico-printing, and in preparation of leather; in making nitro-glycerine and other explosives; is added to gas-meters to prevent from freezing in intensely cold season, is a necessary ingredient in making copying, hetrograph and copying ink. (See "Glycerine from Soapmakers Lye," Part I, Chap. XXVI.

Glycerizin.—A kind of sugar extracted from the liquorice root (*q.v.*)

Goa Powder.—Chrysobine, araroba; a yellow powder: a remedy for herpes or ringworm.

Goat's Rue.—*Sarphooka.*

Gold.—Pure gold is bright and yellow. Density 19·4, melting point 1064° C., soft, malleable and ductile. 24 carat gold is quite pure.

Gold Beater's Skin.—An extremely fine membrane made of the intestines of animals, principally sheep. It is used by gold beaters to interlay with the

leaves of gold which are under the process of hammering. It has the peculiar property of not altering its dimensions, even under the long-continued beating it receives.

Gold Chloride.—Prepared by the action of aqua regia (*q. v.*) on gold.

Gold Leaf.—Gold beaten between skins and membranes to a degree of extreme thinness. The best wrought gold is so thin that 1 grain covers 57 square inches; and 282,000 leaves are required to form a packet of an inch in height.

Gold Size.—A thick tenacious kind of varnish which dries rather quickly. It is used by gilders to form the letters and other objects which are to be gilt, in order to make the gold leaf adhere to them; it is sometimes slightly mixed with a yellow colouring substance. There are many receipts, among which is the following: Expose boiled linseed oil to a strong heat in a pan; when it emits a black smoke, set it on fire, and in a few minutes extinguish it by putting on a cover; then add some spirits of turpentine, till of a proper consistency when cold.

Gold Solder.—The alloy used for soldering gold articles is composed of 12 dwt. pure gold, 2 dwt. pure silver and 4 dwt. copper.

Gold Thread.—L. Coptis Testa, Wall. *Mamira, Mishmee, Teeta.*

Golden Apple.—Nutmeg; *Jaiphal.*

Golden Varnish.—Is made of 16 ounces of boiled linseed oil; 8 ounces of Venice turpentine, and 5 ounces of Naples yellow. Heat the oil with the turpentine, and mix the Naples yellow pulverised. See also Part I, pp. 176, 177.

Gooseberry.—*Karaunda, tipari,* used for pickling and making imitation jam of grapes, contains mallic acid and sugar. Cool climate, rich soil, and plenty of manure, helpful to growth.

Gourd.—*Lauki*; *ghiya*; *tori*

Gr. Gram.—About one masha;

Granite.—Hard composite rock, containing felspar, mica and quartz. Red granite used in masonry.

Grape.—*angoor, drákṣh,*

Grape Sugar.—Dextrose, GLUCOSE.

Granulate.—To form into grains.

Grated.—*ghiakas.*

Greek Fire.—An inflammable composition of such great power of cumbustion as when once lighted not to be extinguished by any means, not even by water. The composition is now unknown but asphaltum and a strong kind of gunpowder are supposed to have been its principal ingredients.

Grevia.—*Falsa.*

Grislea-Cormantosa.—*Dhaiphool*; *Kesu*

Greater Cardamom.—Amomum Subulatum, Roxb. L. *Bari Ilaichi.*

Greater Galangal.—Alpinia Galanga, Wild.

Green Oil.—Heavy crude creosote oil.

Green Vitriol.—Ferrous sulphate ; *Kasees.*

Gregory's Powder.—Contains magnesia, rhubarb and Ginger ; a safe aperient.

Groundnut, *moong phali*. See Part 1 p. 43.

Guaicum Wood, or lignum vitæ.—A wood from the West Indies

Gum.—The mucilage of vegetables ; the principal gums are : 1, the common gum obtained from the plum, cherry tree, etc. *Gum Arabic* which flows naturally from the acacia of Egypt, Arabia, and elsewhere. *Gum Senegal*: a similar species, brought from Senegal and other parts of the coast of Africa ; and *gum adragant, tragacanth,* or *gum dragon*, obtained from a small plant of the same name, growing in Syria.

Gum Arabic—*Sama arabi, gond keekar.* (See Chapter on mucilages in Part 1 p. 69.

Gum Shellac. *Lakh,*

Gum, British.—(See Dextrine.)

Gum Chewing.—See Sen-Sen in Part 1 p. 111.

Gum Copal.—*Chandras.*

Gum Elastic.—(See Caoutchouc.)

Gum Tragacanth.—Is insoluble in cold water, but swells in hot water to form a mucilage that would not be filtered. It is obtained from a group of trees growing on the coast of the Mediterranean. *Kateera Gond.* See p. 603.

Gun Metal.—An alloy containing 90% copper, 8% tin and 2% zinc.

Gunpowder.—A compound powder, used to explode in various descriptions of fire arms, the great quantity of air liberated by the combustion occasioning a projectile force, capable of propelling bodies to a very considerable distance. Its ingredients are 78 parts of saltpetre, 12 of charcoal, and 10 of sulphur. These are ground together with great care and much labour, until they are completely incorporated with each other, and form a powder, commonly called meal powder, in which state it is used for fireworks of various kinds. For the use of the firearms it is formed into grains by being rubbed through sieves, while yet in the state of a damp paste (the ingredients being ground in water). Being dried, it is next put in barrels and these are turned round, so that the grains rubbing against each other become glossy: forming glazed powder, or the kind most employed by sportsmen.

Gyrema-Sylvastrus.—*Medhasingi.*

Gyusandropis Pentaphilla.—*Hulhul.*

Gutta Percha.—A hydrocarbon and oxygenated resin obtained from the latex of a Malayan tree; used to insulate cable and telegraphic wires, and in tubing.

Gypsum.—*Gaudanti, Makol.* Hydrated sulphate of lime, Alabaster, a white variety resembles marble; selenite is transparent and crystalline; satin spar has pearl like lustre. Gypsum on being calcined, two-thirds of water being driven out, forms plaster of paris, used in making chalk crayons, in moulds, casts, and statuory. Gypsum powder used as manure and in the manufacture of porcelain. Punjab source, Jhelum Valley.

Halides.—Chlorides.

Hæmetite.—Native ferric oxide, red iron stone.

Hair Salt.—The native sulphate of magnesia, so called from the shape of the crystals, which may be

either a bead or torus, that is, either projecting or indented.

Halogens, or Halogenia.—Substances which by combination with metals produce saline compounds, such as chlorine, iodine, bromine, fluorine, which are simple halogens, and cyanogen, which is a compound halogen.

Hamemlis Water.—The juice of *sheesham* leaves.

Hartshorn, Salt of.—An impure carbonate of ammonia.

Hardening of Steel and Iron—Is accomplished by lowering its temperature from one at or near to a red heat, to a considerably less degree. This is mostly accomplished by heating it to a certain extent, and then plunging it into cold water, or in the case of small cutting instruments into grease. (See Case-hardening and Tempering.)

Heavy Spar.—Native sulphate of barytes.

Helium —A radio-active element, the gas being next lightest to hydrogen, but having the advantage of being incombustible, and so used in filling the baloons attached to zeppelins.

Hellebore.—*Kutki, karu, kaur*. Makes excellent condition powder for horses and is a specific for tubercular affections , is a great vermin-killer. Grows wild in the Himalayan hills.

Heydycymus.—*Kapur kachuri.*

Helicleris Isoma,—*Marorphali.*

Hemp.—The fibres of the bark of cannabis sativa. It is prepared for spinning, by macerating in water, beating, washing off the impurities and combing. See p. 39.

Henbane.—*L. Hyoscyamus. Bagarbhang.*

Henna.—*Menhdi*. B. Lawsonia Alba.

Hermetical Sealing.—Is used to denote the perfect closing of vessels, so as to prevent the inlet or outlet the most subtle fluids or bodies. In stopping glass vessels it is usual to heat the neck, until it is quite soft, and then twisting it with a pair of pincers.

Hogweed. L. Boerhavia Repens,

Honey, a sweet and scarcely fluid substance, which is collected by bees from the nectaria of flowers, and deposited in the cells of the combs for the support of the bees and their offspring. There are three sorts of honey; *virgin honey,* which spontaneously flows from the young combs when taken from the hive, and put to drain. *White honey,* which is thicker than the former, and often indeed almost solid: it is procured by pressing the combs, but without the assistance of heat; and the *common yellow honey* obtained from combs, first heated over a fire, and then pressed. For Artificial Honey, see Part I. *Madhu, shehd, makhion, asl,* contains glucose, dextrose, wax, *mucilage,* oil, mineral substance, colouring matter, flavouring matter, pollen, a trace of formic acid which acts as a preservative.

Horn.—An animal substance, chiefly membranous, composed of coagulated albumen, with a little gelatine, and about half a percent of phosphate of lime. The word horn is also used by architects to signify the Ionic volute, and artizans call by the word horn any piece of timber or metal, which projects beyond the general surface, or beyond that part of the timber which is useful.

Horn, Artificial, or *Tanned Gelatine.*—A French manufacture, for the construction of a variety of articles, such as snuff boxes, knife handles, etc. The gelatine is obtained from bones by treating them with a weak solution of muriatic acid and it is afterwards tanned by the common process, as in making leather. Upon becoming hard and dry, it assumes the appearances of horn or tortoise shell. It is softened by being boiled in water with potash when it may be formed into any shape, and the figure preserved by drying the articles between moulds.

Horn Blende.—Compound silicate of magnesium, iron and calcium.

Horn Silver.—Native silver chloride.

Horse-raddish.—*Senjna, suhanjna.*

Horse-power.—In steam engines, is estimated by Mr. Watt, that 30,000 pounds, avoirdupois lifted one

foot per minute for one horse. A steam engine, therefore, which is capable of doing twenty times this work, is said to be of twenty horse-power, and so on for other measurements.

Hoya-verdifolia.—*Nak chhikni.*

Humus.—Decayed vegetable matter used as manure.

Hydrarg-chlor-nit.—Is obtained by acting mercury with aqua regia.

Hydrochloric Acid.—*Namak ka tezab,*. Produced by the action of sulphuric acid on common salt.

Hyosymus Niger. *Ajwain khursani; Bazrul banj.*

Hydrochloric Acid.—Muriatic Acid.—A compound of chlorine and hydrogen. In chemistry and medicine, the term hydrochloric acid, and for its salts the terms hydrochlorides is used; but in the arts and manufactures, the older words muriatic acid and muriates are still mostly employed.

Hydrochorides.—Combinations of hydrochloric acid and various bases. Hydrocyanic Acid. Prussic acid, (which see.) A compound of cyanogen and hydrogen.

Hydrocyanic Acid.—Prussic acid, present in almonds and in the leaves and seeds of apricots, and in tobacco, a light colourless, clear, limpid liquid ; intensely poisonous, single drop fatal.

Hydrofluoric Acid.—Is obtained by acting flour spar with sulphuric acid. It etches glass and, therefore, is kept in rubber bottles.

Hydrogen.—The lightest gas ; can be liquified at 253° C. ; manufactured by the action of dilute sulphuric acid on commercial or granulated zinc ; used for filling baloons, and in hardening fats and oils, for making margarine, for the manufacture of ammonia.

Hydrogen Peroxide.—Unstable viscid liquid obtained by chemically mixing hydrated peroxide of barium and dilute sulphuric acid : or, produced by shaking turpentine with water in the presence of air ; used in bleaching and dyeing.

Hydrometer, Nicholson's.—Mark the fixed point on the stem. Find out the weight of the empty

hydro-meter also. The height of the hydrometer is equal to the weight of the liquid displaced by it ; sinks upto the fixed point.

Hydrometer, Universal.—The specific gravity of water or unit is shown by the figure 1000 on the stem. When the hydrometer is placed in any liquid, its specific gravity is at once read off the stem. If it sink more than 1000, the liquid is lighter than water; if below 1000, the liquid is heavier. The sp. gr. of the liquid will be the figure upto which the stem sinks divided by 1000.

Hydro-oxalic Acid.—A peculiar acid formed during the action of nitric acid on sugar, gum, and other substances. When in its utmost state of concentration it is in the form of a syrupy, colourless, inodourous, and intensely sour liquid, of the specific gravity of 1·415 at 60° Fahr. It is deliquescent, and unites in all proportions with water and alcohol, but is only sparingly soluble in ether.

Hydrous Wool Fat.—LANOLIN. See Part 1 p. 316.

Hygroscopic Substance.—One that absorbs moisture from the air.

Hypo or *sodium hyposulphite, or sodium thiosulphite* Obtained by the direct combination of sodium sulphite and sulphur : used as antichlor and as fixative in photography.

Hypochlorous Acid.—A strong bleaching agent, formed by combination of nitric acid and bleaching powder.

Hyssop.—*Zufa.*

Icelandspar,—A fine variety of crystallised carbonate of lime, remarkable for its clearness and for the beautiful double refraction which it shows.

Incense.—A substance that on burning gives out sweet smelling fumes : *dhup*, *agarbati*, *loban*, are most of the articles used in India. Mixed dhup is sold in the bazar. It consists of crushed copra, *chhail chhaleera billi lotan* (rushes), *guggal*, *Kapur Kachri*, *hayu ber*, etc., and coloured with red ochre.

Incineration.—Reducing to ashes by burning.

Incorporate.—To mix well.

Indian Bdellium.—L. Commiphora Mukul, Engl. *Guggul, Maqul.*

Indian Caraway,—Carun Bulbocastaneum, Koch. *Sahjira ; siyah jeera* or *zeera.*

Indian Fig.—Banyan tree fruit. The milk of banyan is a great tonic for cases of seminal emissions. Holds out possibilities of being advertised as a trade article Ver. *Golar.*

Indian Gentian.—L. Picrorrhiza Kurroa, Benth. *Kaur, Katki.* See Helebore.

Indian Gum Arabic Tree.—L. Acacia Arabica, Wild, *Babul, Kikar, mugheel.*

Indian Hemp.—L. Cannabis Sativa. *Ganja.*

Indian Kino.—L. Pterocarpus Marsupium, Roxb. *Bijasar.*

Indian Olibanum.—L. Boswellia Serrata, Roxb. *Salaigond*

Indian Pareira Brava.—L. Cissampelos Pariera. *Akandi.*

Indian Pennywort.—L. Hydrocotyle Asiatica *Brahmabuti, Thukkuri Zarnab.*

Indian Sarsaparila.—L. Hemidesmus Indicus, R. Br. *Anantamul.*

Indian Senna.—L. Cassia Augustifolia, Vahl. *Sanamukki, senna.*

Indian Valerian.—L. Valeriana Wallichi, Dc. *Musk-bala.*

Indian Wintergreen.—L. Gaultheria Fragrantissima, Wall.

Indigo. *Neel.*—The extract from the leaves of a plant native to India. " An enzyme in the leaf acting on a water extract of the colourless glucoside in presence of atmospheric oxygen gives indigotin, the colouring matter of indigo." Only half per cent. of indigo is thus derived from the leaves. Synthetic indigo has now taken the place of the natural product. It is prepared from naphthalene.

Indigo Carmine.—Sulpho-indigotic acid.

Indium. A soft white metal found in certain zinc ores; on being burnt in air emits bluish flame, allied to metals of the aluminium group.

Industrial Spirit.—Impure ethylic alcohol, with addition of mineral naptha or other hydorous chemical; much used in hair washes; objectionable odour disguised by eugenol or other spicy aromas. See Part 1, p. 204.

Infusion.—Extract made from a substance by steeping it in water. Ver, *Khaisandah*.

Infusorial Earth.—See Kieselguhr.

Iodine Acid.—A colourless, crystalline solid, soluble in water; made by heating iodine with strong nitric acid: very unstable compound.

Iodide of Lead.—Is formed by the action of iodic acid on a lead salt.

Iodide of Mercury.—Is obtained by triturating mercury and iodine together.

Iodine.—A non-metallic bluish-black shining element. At ordinary pressure can be made to melt without turning liquid; at a slightly greater pressure than of one atmosphere melts at 114° C. Manufactured from kelp, but more extensively from caliche from S. America. With the help of potassium iodide, a watery solution can be made of iodine. Solution in alcohol, ether or water is brown; in carbon bisulphide, it is purple. Presence of starch gives deep blue colour; hence an excellent test for detecting the presence of starch. Iodine is present in the thyroid gland and so very minute quantity of it in food, let it be one-millionth part, most essential for health. It ought to form part of all medicines for rejuvenation.

Iodide of Potassium.—Is obtained by the direct action of iodine on caustic potash.

Iodoform.—Yellow crystalline, chemical with characteristic strong smell; antiseptic and disinfectant.

Ipecacuanha.—The root of a creeping plant of coffee group, native of Brazil. The root in powder form acts as an emetine, inducing vomitting by emptying the stomach. Effect due to the active principle, emetine. Useful in bronchitis, diphtheria, and laryngi-

tis. and a specific in dysentry. A good expectorant. B. Psylhotria Ipecacunha, Stokes.

Iridium.—Metal of platinum family; sp. gr. 22·4; melting point 2,000° C.; alloyed with platinum used as standard bars; alloyed with osmium for hardening the tips of fountain pens.

Iron.—Atomic weight 55·85; found abundantly as ferrous oxide or ferrous carbonate; fuses at a very high temperature, 1525° C.; when pure, dry air has no effect, but presence of moisture coats it with a hydrated oxide. Red hot iron dipped in water sets free hydrogen and unites with oxygen to form black magnetic oxide of iron. **Oxides:** (1) *Ferrous* or *monoxide.* (2) *Ferric, sesqui* or red oxide, used for polishing, as pigment and rouge. (3) *Black* or *magnetic oxide,* yields ferric and ferrous salts. *Carbonate and phosphate of iron* used in medicine, as iron imparts redness to the hæmoglobin of blood. The presence of various impurities greatly changes the properties of iron; slag makes it brittle; small amount of carbon makes it malleable; 0·3 to 1·5 per cent of carbon makes it steel; 4·5 per cent cast iron. Slow cooling after iron being heated red hot makes it strong: quick cooling by immersion in water or oil bath rather weak and brittle.

Iron Chloride.—Is obtained by heating metallic iron in a current of dry hydrochloric acid gas.

Iron Filings.—*Lohechoon, burada ahan.*

Iron Mordant.—Ferrous sulphate.

Iron Reduced.—*Sonamakhi*; *Charak Tala.*

Iron Rust.—Khabsul Hadeed.

Isinglass.—The purest form of gelatine or glue from fish, the best form being obtainable from swimming bladders, sturgeon, shark; etc., used to clarify beer and alcohol by mechanical precipitation of particles and to give lustre to silk stuff. 98% of good isinglass is soluble in water. It forms a nutritious jelly, when boiled and so is largely used by confectioners in England. Brandy added to the strong water solution of isinglass, makes it less liable to decay. Isinglass cement does not bear hot water. *Susreshmahi. See also Glue above.*

Ivory.—A form of dentine, from the tusks of boars and elephants, hippopotamus, and walrus; used for ornamental work, for bangles, knife handles, billiard balls, piano keys and carved work. Celluloid, vegetable ivory from corozo nuts from the Andes, used as substitutes.

Ivory Black.—An animal charcoal produced by burning ivory in closed vessels; like the other forms of animal charcoal, it is very effective in depriving certain substances of a bad odour and colour. It is a valuable pigment for the artist, both ground in oil and water, forming a colour of a good body, which dries better than lampblack, and is pleasant to work.

Ivory, Etching on.—Cover the surface of the ivory with a ground made of the following ingredients, melted together:—Pure white wax, 1 oz.; asphalt, ½ an ounce. This compound is to be poured in lukewarm water, kneaded into a ball, and wrapped in taffeta. The ivory being warmed, the ball of etching ground is to be rubbed on it. The figured design traced on this with a needle, a leg of wax put round it, and the surface then etched or eaten away with strong sulphuric acid. Simple white wax will answer instead of the above prepared ground, and hydrochloric acid instead of the sulphuric.

Jaborandi.—A drug obtained from a Brazilian tree.

Jack Fruit,—*Kamthal.*

Jade.—Native silicate of calcium and magnesium; a greenish, hard stone, made into ornaments.

Jaggery.—A sugar derived from flowering shoots of an Indian palm. Fermented juice on being distilled yields *arrk.*

Jalap.—*Julaba*; *bekh Julaba.*—The dried tuberous roots of a plant, a native of Mexico; somewhat smoky smell, sweet nauseous taste. Extract jalap resin used as purgative. B. Ipomvea Purga, Heyne.

Jamaica Pepper.—Pimento or allspice; *sarad chini; seetal chini.*

Jambul Seeds.—L. Eugenia and Jambolana, Lam. *Jamun. Kala Jam.*

Japan Ink.—A superior kind of writing ink, so called from its better colour and lustre. To make it :— Take 8 oz. of Aleppo galls., 4 oz. of sulphate of iron, 3 oz. of gum arabic, 1 oz. of boiled sulphate of copper, and 1 oz. of sugarcandy. To be boiled in 8 pints of water till reduced to 6 pints.

Japanning.—The art of covering wood, paper, or metal, with a thick coat of a hard, brilliant varnish, It originated in Japan, whence articles so prepared were first brought to Europe. The material, if of wood, or papier machee, is first sized, then covered with several coats of hard copal varnish ; each of the latter coats being polished with putty powder and water, previous to laying on of the next. Metalwork and numerous other articles have but one or two coats laid upon them, and these are dried by the heat of a stove or oven.

Jasmine,—*Yasmeen, Jasmeen, chambeli.*

Jasper.—A siliceous mineral of various colours, sometimes banded or variegated. It takes a fine colour and the variety and richness of its colours render it useful in the ornamental arts. The blood stone is a variety of it. *Yasham, Yeshb, zahbarad.*

Jecquirity.—Abrus Precatorius, L. *Goonja, Koonch.*

Jew, Pitch—see Belamen.

Jujube.—*Unab, ber.*

Juniper.—A coniferous shrub ; berries used for flavouring gin; unripe nuts yield juniper oil. *Hayo Ber, Abbhal* B. Juniperis Communis.

Juniper Gum.—*Chandras.*

Kainite.—Double salt of potassium-magnesium sulphate and magnesium chloride, from Strassfurt deposits, used as manure. A very good manure.

Kaladana.—B. Impromoca Haderocca.. *Kaladana Nilkalmi.*

Kamela.—Mallotus Phillipp inensis, Muel Agg. *Kameela.* Of Chamomille.

Kaolin.—China clay, *chini mitti* aluminium silicate. colour pure white, used for manufacturing china and porcelain ; and for hardening gelatine in hectographs.

Kapok.—Silky fibre of Indian silk-cotton tree (*shalmali*; *simbal*) or used for stuffing pillows, mattresses and life-belts; *simbal ki rui.*

Karanja.—B. Pongamia Glabra, Vent. *Dahar-karanja.*

Kattha.—See Catechu.

Kelp.—Ashes of burnt seaweed, formerly used for making soap and glass, source of iodine, potassium chloride, charcoal, oils, and ammonium sulphate.

Keratin.—A gelatinous substance obtained from the hair, hoofs and nails of animals.

Kermes.—(mineral), A mineral form of antimony sulphide.

Ketones.—Compounds of carbonyl group; 'produced by the oxidation of secondary alcohols.

Kg.—Abbreviation of KILOGRAM.

Kieselguhr.—A soft, white, silicate earth, from the dead bodies of diatoms or from the remains of watery plants from Bohemia or U. S. A., used for soap-making, for polishing, and for filteration, and as an absorptive material in making dynamite. Wrongly called Infusorial Earth.

Kieserite.—Mineral magnesium sulphate.

Kilogram.—About one seer and four tolas.

Kipler's Nickel.—Compound of nickel and arsenic.

King's Yellow.—Arsenic sulphide.

Kino.—A reddish black, brittle, shining, inodourous gum from a tree in W. and E. Indies; soluble in alcohol and boiling water; a powerful astringent useful for diarrhœa and gargles.

Kulekhara.—L. Hygrophila Spinosa, I. And.

Lac—Resinous exudation from certain insects on trees like pipal, ficus indica; on purifying with hot water turned into shellac. For sealing Wax. See Part 1 p. 228.

Lacerta Cenice.—*Reg Mahi.*

Lacquer.—Solution of shellac in alcohol, with gum and suitable pigments. (1) Transparent polish for

coating metallic surfaces to improve colour and to prevent tarnishing. (2) China lacquer made from juices of certain trees, purified and mixed with shellac etc. For recipes to make Lacquers, see part 1 p. 176,

Lactic Acid.—a syrupy liquid prepared by the action of lactic acid bacteria on sugar; present in sour milk and curd; used in leather industry, for calico-printing and brewing.

Lactose.—Milk sugar; see part 1 p. 27.

Lakes.—Pigments obtained by precipitating dye-stuffs and colouring matters from aluminous earths, plants or insects, e.g., carmine, scarlet, maddox, cochineal, lac lakes.

Lamp black.—The carbon given off by lamps which but imperfectly decompose the fatty materials with which they are fed. Soot is the carbon which escapes from smoky fires; and coke the carbon procured by the partial burning of coals. Each of these kinds has its own peculiarity, and except common charcoal, is impregnated with either earthy or oily particles. Charcoal is infusible, incombustible without air, but the most combustible substance in nature when air is admitted. It forms part of all animal and vegetable matters. It is black, inodorous, insipid, brittle, an excellent conductor of electricity, but a bad conductor of heat, it remains uninjured by time, or the effects of air and moisture. It combines with most of the simple substances, forming carburets. Charcoal is valuable as a fuel, which gives an intense heat without smoke; as an ingredient in gunpowder; as a substance which rapidly absorbs ill odours, and considerably retards the putrefaction of animal substances; as an ingredient in indestructible writing inks; by artists as crayons, and numerous other purposes.

Lamp black is finely divided charcoal or soot, obtained by the imperfect combustion of various oily or resinous substances. It may be obtained in small quantities by the holding of any cold substance close over a common lamp. The manufacture on a large, scale is conducted in chambers lined with old sacking, upon which the soot from a large smoky fire is collected. It is used as the basis of black paint, and for other purposes.

Lanolin.—See part I p. 316.

Lapis Lazuli.—An argillaceous stone of a beautiful blue color, which when pounded and ground forms for the water colour painter the finest blue pigment hitherto discovered, commonly called and known as ultramarine. This stone is discovered in various countries, those of Asia and Africa, however, greatly surpass, both in beauty and real value the Bohemain and German sorts. Ultramarine. *Lajward.*

Lard.—Pig or boar's fat, that has been melted and strained to remove the connective tissues ; a soft white almost odourless grease, melting point 40° C. ; used as basis for ointments, and as lubricant.

Laudanum.—Made by dissolving one grain of opium in 15 drops of alcohol.

Laughing Gas.—Nitrous oxide, a colourless gas : somewhat sweet smelling ; inhaled along with air produces slight hysteria ; inhaled pure in tooth extraction.

Lavendula Sloe.—*Ustakhdoos.*

Lemon Chrome.—Barium chromate.

Lead.—*Seesa* A blue-gray metal, shining when newly cut, later on covered with black oxide, sp. gr. 11·38 ; melting point 328 C. soft, plastic, non-ductile, nonelastic ; extracted from galena ; used for making gas and water pipes, roofing, bullets, shot, accumulator plates; alloyed with other metals to manufacture solder, pewter and type-metal. **Litharge or massicot,** lead oxide, used in making flint glass and in paints. **Red Lead** used for making pottery glazes, paints, matches, and flint glass, Nitric acid acting on red lead produces **Lead Peroxide,** an oxydising agent. **Lead Acetate** can be made by dissolving lead, litharge or powdered *murdah sang* in acetic acid ; called also **sugar of lead ;** a white crystalline solid, soluble in water, used in dyeing, in making varnishes and as disinfectant and insecticide. **Lead Chromate** is chrome yellow and is used in making pigments. **White Lead** or basic lead carbonate is used in paints. *Sufaida, Nag Bhasma.*

Lead Nitrate.—Obtained by heating lead with nitric acid.

Lead Sulphate.—Formed by heating lead with sulphuric acid for a sufficiently long time.

Leaven.—A piece of sour dough used to ferment and render light a much greater quantity of dough or paste. *Khameer.*

Lecithin.—A compound prepared from the yolk of egg, *momayai*, Constituents, glycerine, chlorine, phosphoric and fatty acids; soluble in alcohol from which it can be crystallised in waxy needles; insoluble in water; essential ingredient of brain and nerve tissue.

Leclanche's Cell.—Each element of this battery is a rod of carbon placed in a porous pot which is then lightly packed with a mixture of pyrolusite (peroxide of manganese and coke). The porous pot is contained in an outer vessel in which is the electro-positive metal zinc. The exciting liquid is a solution of sal-ammoniac Ganot.

Legumes.—Pulses like peas, beans, grams, furze, laburnum and broom. Over 1200 varieties.

Legumine.—A form of gluten. See preceding.

Lemon.—*Nimbu, lemun*, Abundantly cultivated in the Central Provinces and elsewhere; contains citric acid which has a cooling, refreshing flavour. Essence of Lemon extracted from the fresh rind; juice from the pulp. The rind can be candied as candied peel. The juice can be preserved from fermentation and from the formation of scum by pouring over the fresh juice some sweet oil in a bottle and corking it securely.

Lemon Acid.—Citric acid.

Lemon Chrome.—Colour resembling the lemon rind.

Lemongrass or Citronella.—A sweetly scented Indian grass, from which Citronella or *Rosha Astamboli* is extracted.

Lentils.—Legumes, *masoor, moth, moong, arhar, tuar, urad* or *mash*, contain about 20°/₀ proteid, about 50 per cent. starch. *Moong* and *tuar* are easily digestible; *masoor* is heat producing and so must contain more of starch and less of proteid. *Moth* and *mash* have considerable food value, the former being more digestible, and the latter more tasteful. Both of these

should form the essential ingredients of every vegetarian's menu. All of them turned into different kinds of Indian confectionery and in Hulveas, which see.

Lesser Cardamom.—L. Elettaria Cardamonum, Matt and White. *Chhota-Elachi,*

Lettuce.—Leaves are used as salad.

Levigation.—The reduction to a soft pulp or paste by grinding in water.

Lichen Oderiferus.—*Chhareela, shail pushpa. Chhailchhalera.*

Lime.—Calciumoxide, *sufedi, Chunan.*

Lime or *Linden.*—A tree of the citron family, *galgal,* fruit turned into pickle; juice of the fruit valuable in medicine; wood soft but tough, much used by carvers and turners; fibre yields ropes; sweet-smelling flowers contain a lot of honey. B. Citrus medica, L. Var acide.

Loamy.—Clayey, marly.

Limelight.—Produced by directing a narrow flame of coal gas mixed with oxygen or oxyacetylene flame on a piece of some infusible calcium salt, e.g., calcium; thorium magnesium or cerium. The piece of lime should be rotated or raised every few minuts to get steady white light, otherwise it is liable to be pitted.

Limestone.—When pure *i.e.* calcium carbonate, it is soft and readily acted upon by dilute acid. Crystalline varieties: marble, calcite, stalactites and stalagamites. Chalk is non-crystalline variety. Magnesium limestone is known as dolomite. Used largely for the manufacture of lime by burning with coke Limestone buildings subject to much wear and tear, especially in towns, on account of the presence of carbonic acid gas in large proportion, *chune ka pathar.*

Lime-water.—Made by steeping lime in water and by filtering the clear supernatant liquid. Half a grain of quicklime to 1 oz of water is sufficient. Milk of lime is saturated solution of lime in water. This mixed with olive or linseed oil makes Carron Oil and is useful as soothing salve in burns and scalds. See pp. 349, 486.

Linament.—A liquid usually containing oil used for rubbing on the body, or any part thereof for allaying pains; an embrocation.

Linoleum.—A floorcloth, a mixture of cork dust and mineral colouring matter, ground with oxidised linseed oil to a uniform stiff paste, and spread in a layer of one-eighth to one fourth inch thick on canvas by means of suitable machinery. Propularly known as Oil Cloth or *Mom jama*. Patterns printed in oil colours.

Linseed, *Alsi, Bazrul qatăn*.—The seed of the flax plant. Has yellow or deep violet flowers. Oil used as paints for its quick drying quality. For details, see pp. 40, 41, 88, 317.

Liquid Storax.—L. Liquidamber Orientalis, Miller. *Silaras, silajeet,* a great tonic. See p. 309.

Liquors, strong alcoholic beverages, flavoured aromatically and often sweetened.

Liquorice, *mulethi, assoos, yashthi madhu*. The root of a plant. Extract *mulethi ka sat* used as demulcent and in confectionery: also forms part of mixed incense and sen-sen. B. Glycyrrhyza Glabra, L.

Litharge.—Calcined lead, forming a vitrified oxide. It is used by painters to boil with linseed oil, which occasions it to dry much more easily than in its uncombined state, the litharge, being dissolved in the oil. A very good drier of wounds. Masicot,—*murdansang*, yellow oxide of lead.

Lithium. Metalic element of silvery appearance; imparts a beautiful red colour to non-luminous flame; lithium carbonate eliminates uric acid and so prescribed in rheumatism and gout.

Lithographic Chalk.—A material made in the shape of drawing crayons, and intended to produce the same artistical effect upon stone as the ordinary chalks do upon paper. The receipt for an approved chalk of this description is as follows:—Common scap, 1½ oz.; tallow 2 oz.; white wax 2½ oz.; shellac, 1 oz. Soap is the only ingredient which must not vary, it is intended as an alkali to render the whole miscible with water. When melted the last time, it may be cast in paper cartridges, or on a marble slab, and cut up into slips when nearly cold. It must be kept in well-stoppered phials that damp may not reach it. The wax and tallow are heated in an iron saucepan till

they catch fire; the soap is cut into small pieces, and added by degrees, stirring the whole time. When dissolved, the burning is continued, till reduced to the volume the mass was before the putting in of the soap; then extinguish the flame, add the shellac, pour a little on a cold plate, and see if, when cold, it breaks in two; if so, it is perfect. It is to be melted again, and the lamp black added.

Lithographic Drawing Ink is for executing writings on stone of drawing plans, &c., which shall be representations of those executed with a pen. Its composition is as follows:—Equal portions of tallow, white wax, shellac, and common soap melted together; afterwards add lamp black as a colour. The method of manipulation is the same as for lithographic chalk. When finished, it should resemble Indian ink, and is to be used in the same manner with a fine pointed steel pen.

Lithophone. Obtained as precipitate on mixing solution of barium sulphate and zinc sulphate, Manufactured in large quantities as white paint and enamel; used in rubber and paper-making industries.

Litmus.—Extract of lichens, used for acidmetry: acids turn blue litmus red, alkalies redden litmus blue; made by adding potassium carbonate to lichens, fermenting the mass and then mixing with plaster of paris. Litmus paper can be made by passing thin strips of blotting paper through solution of litmus in water. Litmus is present in black peel of carrots: this is why in pickling with mustard, fermentation, and so production of acid by the action of bacteria, reddens the pickling solution.

Liver of Sulphur,—A mixture of potassium sulphide.

Lucerne,—Alfa-alfa grass; beautiful light blue flowers, makes delicious fodder; once planted yields grass for twelve years or more, *Lhassu.*

Linden,—See Lime.

Linen.—Cloth made from fibres of flax plant.

Lixiviate,—To extract by solution or washing alkaline substances from their mixtures.

Loaf-sugar,—Refined sugar.

Log wood.—The wood of a small tree, called the *hœmatoxylon eompechianum* It is heavy, hard, compact, of a fine grain, capable of being polished, and scarcely susceptible of decay. Its chief use, however, is not as a wood ; but on account of the fine red or purple dye which it yields both to water and alcohol, a solution with the former is valuable to the dyer, with or without alum or tartar. *Cederala Tuna* of India is a kind of logwood but it does not yield any dye.

Logwood Extract is made by boiling 1 part of Logwood in 50 of water.

Long pepper,—*Peepal, magh, Filfaldaraz,* B. Piper Longum.

Long-Zedory.—*Karchoor* ; *Zaranbad.*

Lotus flower,—*Neelofar, utpal, Neelotpal, Nufar.*

Lotus seed.—*Kanval gatta, Kaul doda*—Padam bees

Lubricants,—Greasy agents to reduce friction between metallic surfaces.

Lucille.—*Phal godne ka kanta : Pb. Chobha.*

Lunar Caustic,—Silver nitrate, fused. See p. 385.

Lute.—A substance of a pasty consistency, for joining or making tight the joints of vessels. Lutes are of various kinds. Common dough with salt in it is a useful lute for the distiller ; putty is also often employed, or clay mixed with linseed oil. Lime slaked in the air, and mixed with the white of eggs, is another kind.

Lycopodium,—*Hathjori.*

Lye,—Water impregnated with alkaline salt obtained from the ashes of wood etc.

Macaroni,—A tubular kind of vermicelli, prepared originally in Italy from hard wheat by turning the white flour into a dough and molding same into cylinderical hollow tubes : chief composition, gluten.

Mace,—*Jawatri* : a sweet-smelling spice; forms part of many cordials and tonics : the red aril of a plant native to Moluccas, and now grown in the West Indies

and the East Indies. The spice is very fragrant and aromatic, and is used in cookery and in medicine.

Macerate,—To digest, to soften by steeping, *Bhigona*.

Macintosh or **Mackintosh**.—Cloth overlaid with rubber used for raincoats and for laying over carpets liable to be spoiled by babies.

Madar.—*Ak*, a small plant growing almost everywhere in India, especially in sandy soils: the stems full of milk, which makes sympathetic ink and is used as depilatory in tanning; leaves pickled in vinegar; cloves in the flowers make an excellent *churan*; cotton from the pods stuffed in pillows. Old roots used as drier in medicine. All parts of the plant have great value in medicine.

Madder. —*Majeeth*; used in dyeing red; superseded by alzarine, its active principle, now made synthetically.

Magenta,—Fuchsine: a red colour, but green in appearance.

Magnesite,—Magnesium carbonate, found in Austria, Hungary, Greece and India. Used for fireproof vessels, bricks, furnace lining, and for magnesite cement for flooring. The cement sets more quickly than Portland Cement. For all the above purposes, magnesite is turned into magnesium oxide by heating. Source of other magnesium compounds.

Magnesium,—A silvery white metal, obtained by electrolysing fused carnalite or fused chloride of magnesium. The element is present in magnesite and kiesorite; melting point 750°C.; wires or ribbons burn with white incandescent light, and are used in photographic and other flash lights; as deoxidiser in foundries. An alloy with 8 per cent. of aluminium yields as good a metal as gun-metal. Magnalium, a magnesium-aluminium alloy contains only 2 per cent. of magnesium.

Magnesium Carbonate,—Occurs naturally as magnesite.

Magnesia.—Magnesium oxide, made by burning magnesium carbonate. One of the earths, having a metallic base, called magnesium. It is a white soft, light powder,

which shows alkaline properties. It is infusible, except by the most intense heat ; has no smell and little taste. It is nearly insoluble in water but combines readily with sulphur, forming a sulphuret ; and with the acids forming neutral salts, many of them of great value in medicine and the arts.

Magnesia Alba.—The basic carbonate of magnesia.

Magnesium Sulphate.—Epsom salt.—*Julab ka namak.*

Magma.—A thin paste.

Magnetite.—Magnetic iron ore, lodestone, possesses magnetic properties, obtained from Scandanavia.

Magnolia.—Sweetly scented flowers of a plant, colour white, yellow or crimson.

Mahogany—A tree of West Indies ; wood reddish, brown and takes an excellent polish. Cuban mahogany most valuable. A hard and fine wood, much used in cabinet making, upholstery, &c. It varies much in quality ; that grown on rocks is the hardest, heaviest, closest in the grain, and most beautifully veined. That wood brought from the neighbourhood of Honduras, growing in swampy ground, is light, porous, pale coloured, and open grained ; and is used for inferior purposes, and for the patterns of wheel-work, &c. That brought from Jamaica, and the more elevated Spanish Colonies, is of a finer and more mottled description, and is generally known as *Spanish Mahogany.*

Mahua Oil.—Is pressed out from seeds of a tree with the same name, which grows in dry sandy or rocky soil of western Ghats or C. P., Santhal Parganas; excellent for soap-making, but must first be refined ; rancid smell removed by treating with gum benzoin. Cawnpore the biggest market for mahua oil. See p. 38.

Maize oil.—Is obtained from the germs of maize plants, a bydroduct in glucose and starch works using Indian corn as raw material.

Maiden's Hair Fern.—*Hansraj, Hans pidi, Parshaoshan.*

Malabar or Cochin Lemon Grass.—L. Cymbopogon Felexuosus, Stapf *See Lemon Grass.*

Malachite.—Basic carbonate of copper, *zangar*, a dark green ore, used for ornamental purposes.

Malachite Green.—Benzeldehyde Green, a colourless dyestuff prepared by heating oil of bitter almonds with dilute methyl-aniline and zinc chloride followed by oxidation. On treatment with acids turns into bright green salts.

Malaeic Acid.—An acid formed when the malic acid is distilled at a heat of 400°. Its salts are called malaeates.

Male Fern.—B. Dryopteris Fil mas.

Malic Acid.—An acid which exists in the juices of many fruits and plants, alone, or associated with the citric, tartaric, and oxalic acids. It occasions the sour taste of unripe apples, gooseberries, &c. It has no smell, is in the form of crystals which deliquesce in the air, is soluble in alcohol, and is decomposed at a heat of 348°. It combines with numerous bases.

Mallow Abuliton Indica.—*Kanthi.*

Malt.—*Jau-ash.* The chief ingredient of which beer is made, and from which it derives its strength and spirituous qualities. It is made from barley, thus :—The grain is first steeped for 48 hours in a cistern of water ; when taken out it is thrown into a heap, where it begins to sprout. Having thrown out its first root, or acrospire, to a length of from ¼ to ½ an inch it is spread upon a floor, where becoming dry, the germination ceases. It is finally taken to a kiln, and spread upon a wire floor, under which a clear fire is kept up, until the malt is thoroughly dry, and in some cases partly roasted.

Mandrake.—L. Popdophyllum Emodi, Wall. *Bankakri, Banwangan.*

Manganese.—*Khabus-ul-hadeed,* a metal found in pyrolusite or magnesium dioxide, from which it is reduced by means of carbon in an electric furnace, or with aluminium : specific gravity 8 ; m. p. 1245 ; used in making hard steel ; ferro-manganese is a soft alloy ; and is used in making manganese bronze.

Manganese Dioxide, a black solid, used as catalytic agent, as oxidising agent, as drier in paints and

varnishes, as depolariser in battery cells, and in manufacturing chlorine directly from salt with the action of sulphuric acid, or from hydrochloric acid. Mixed with glass gives amethyst tint.

Manganates, sodium manganate, ox green colour changing into purple on addition of water, made use of in making paper barometers.

Mango, the well-known fruit, turned into pickle, jam, and chutney. Wood used for furniture: not so durable and strong. Mango stones contain starch and with the action of pctassium ferrocyanide yield a blue dye. Ver. *Am; amra; amb.*

Manna, *Turanjbeen.* The concrete juice of the Fraximusarnus, a tree much cultivated in Scicily and Italy.

Manures—See part 1 pp. 5 and 7.

Marble, *sang-i-marmar*, crystalline calcium carbonate, used in masonry and sculpture: colours, white, black, variegated.

Margarine, Oleo-margarine, or Butterine, as substitute for butter, much used in England and on the continent. Cheap margarines are made from cotton-seed and copra oils; the expensive ones from the fat of beef. Nickel* is added to the fat or oil as a catalytic agent which changes it into a fat, being solid at normal temperature. In manufacturing margarine, skimmed or churned milk is sterilised by boiling, cooled to 10°C. mixed with lactic acid bacilli to sour it and to give it flavour of butter: the melted fat made with nickel is then added and the whole mass churned until complete emulsification has taken place. It is then allowed to cool, when it becomes solid like butter and is then allowed to mature. It is then mixed with colouring matter like annato, salt, and flavouring like butterine, or butyric acid. See margarine is no good substitute for butter or clarified butter, but most of the citizens have to depend on the so called vegetable ghee, which bids fair to lower the grit and stamina of the vegetarians and so make them easy prey to any blessed epidemic that may visit this land. The pity of it all is that the manufacture is being carried on mostly by the Hindus.

* In very finely divided state

Margosa Tree. L.—Melia Azadirachta, L.

Margosta.—*Neem*.

Marigold.—*Ashrafi phool*, some varieties yield dye-stuff.

Marjoram,—*Niazbo ; rehan ; bantulsi ; marwa ;* leaves mixed with salt stomachic.

Marking Nut,—L. Semecarpus anacardium, *Bhela, Bhilawa*.

Marsh Gas,—Methane, fire damp, a hydrocarbon formed by the decay of vegetable matter and enclosed in coal seams and evolved from marshes ; artificially made by heating sodium acetate with sodium hydroxide ; mixed with air it explodes and accounts for explosions in the collieries.

Marsh Mallow—*Resha khatatmi* ; *Gul Khaira*. B. Althaeer Officianalis.

Massicot,—Yellow oxide of lead, used as a pigment by the painters. See Litharge.

Mastic, Mastiche,—*Roomi Mastaki* or *musqati* a gum resin exuded as yellow tears by Pistacia lentiscus; a tree cultivated in Levant ; m. p. about 108°C., ; used in medicine and in making varnishes. It is yellow, brittle, transparent, rounded ; softens between the teeth, with bitterish taste and aromatic smell.

Maywine Essence.—See Part I p. 143.

Mazerion,—*Bekh Hayat, Koyal Vishwakanta*.

Meadow Saffron.—L. Colchicum Luteum, Baker. *Suranjan*.

Meerschaum.—Sea foam, *samundra jhag* ; hydrated silicate of magnesium, occurring in white clay in Turkey. Spain, etc. ; used for making tobacco pipes ; for leavening dough of *balushahis, rasagullas, jalebis, golgappas,* and mixed with starter gives hardness to curd.

Melting Point.—Is little effected by change of pressure. Impurities change the melting point, and so may be employed in detecting adulteration.

Menthol.—*Sat podeena* occurs in fine colourless icicular crystals, extract from peppermint : menthol

produces cold on evaporation, and so used in neuralgia; prepared synthetically by hydrogenating thymol in presence of a nickel catalyst. Most import from Japan.

Mercerizing.—Gives silky *lustre to cotton textiles when soaked in solution* of caustic *soda while stretched on frames to prevent* shrinkage. The *yarn is washed and dried in this state.* This *strengthens the strength of the yarn and the lustre* is retained when it is dyed.

Mercury,—See Quicksilver'; *seemab, parad, pârá.*

Mercury Nitrate.—Is prepared by the action of nitric acid on mercury.

Mesua Ferru.—*Nagkesar, Narmukha.*

Metallurgy, the art of obtaining metals from their ores and working into them.

Methyl Alcohol.—Wood spirit, prepared from crude spirit which in its turn is derived from the destructive distillation of wood. U. S. A., Germany, and Canada, the principal producing countries. B. P. 66 C. The crude spirit mixed with ethyl chloride forms methylated spirit. Pure spirit used in making dyes, formaldehyde photographic goods, and many medicines. Causes blindness and is an acute poison, and so restrictions on sale for the exaction of duty unjustifiable. Germany free from this duty. *See also Acetic Acid.*

Methylated Spirit.—Sold duty free ; contains 90% ethyl alcohol, 9½%, wood naptha, and ½% dye; Industrial Spirit contains 95% alcohol ethyl and 5% crude wood spirit. Largely used in making varnishes for external use, and for burning in stoves, and generally for all objects where the product is not meant for internal consumption. When methylated spirit is dear fraudulent traders mix kerosene oil. Spirit thus adulterated will give a rather smoky flame.

Methylene Blue.—A dye derived from dimethylaniline, one of the coal-tar products.

Metalloids.—A name given by Berzelius to certain simple substances. They are sulphur, phosphorus, carbon, baron, and silicon. The metallic bases of potassium, sodium and the other alkalies and earths, have been by some also called metalloids,

Methyline.—A peculiar liquid compound of carbon and hydrogen, extracted from pyroxilic spirit, which is reckoned to be a bihydrate of methylene.

Mica.—*Abraq* a mineral consisting of trasparent white or coloured thin plates; aluminium silicate with admixture of soda, potash, lithia, magnesia, and iron in various proportions; some scales 20 in.. in diameter: dug out from mines in Scandanavia, India, Siberia, and Canada; used in making lamp chimneys, stove doors, window panes, furnace windows for motor cars, goggles, *Kendeels* and for heating precious metals by goldsmiths. In India Hazari Bagh, Nellore and Bikaner supply most of the demand, Koderma being the chief market.

Mica-Schist.—A typical metamorphic mineral, one of the crystalline schists, most abundant in nature, of wavy stucture, or containing alternate layers of mica and quartz.

Microcosmic-Salt.—Sodium ammonium hydrogen orthophosphate used as reagent in blowpipe experiments, originally obtained from human urine. On being heated changes into shining sodium metaphosphate.

Milk.—See Part I, p. 19.

Milk of Lime.—Milky solution of calcium hydroxide water impregnated with lime.

Milk Powder.—See Part I, p. 21.

Milk of Sulphur.—Precipitated sulphur.

Milk Sugar.—Lactose, made by evaporating the yellow liquid that separates out when milk gets sour. Addition of this to cow milk makes it as good as mother's milk; basis of the trade product Albulactin. For detailed article, See Part I, pp. 27, 330.

Minced.—*Qimah kiya hua; koftah.*

Mineral.—Any substance, metallic or non-metallic, organic or inorganic, obtained from the different strata of the earth, water and mercury inclusive.

Mineral Green.—Carbonate of copper, obtained by precipitating a hot solution of sulphate of copper by carbonate of soda.

Mineralogy.—The science that studies the classes and properties of minerals.

Mineral Lard.—Soft paraffin.

Mineral Oil.—Liquid paraffin.

Mineral pitch,—Asphalt, a solid bitumen.

Mineral Tar.—The same as petroleum; a brownish black, oily, bituminous fluid, which is found, in the earth, and dropping from rocks in many parts of Europe and Asia; also in the West Indies, whence it is called Barbadoes tar. Called in India Diesel Oil.

Mineral Waters.—Spring waters possessing peculiar properties in medicine. Main constituents, salts of sodium, potassium, iron, magnesium, carbon bisulphide, sulphuretted hydrogen. Such springs have been known since very early times, and are spread all over India and form health resorts, especially patronised by female folk.

Mint.—*Podeena,* mentha verdis, cultivated for table purposes; makes a good chutney with onions, salt and pepper; carminative.

Minium—Red lead, lead tetroxide, *sendhur*; also strictly speaking, Vermillion, (q.v.)

Molybdenum.—Metal of chromium variety; used in making special steel.

Mm.—Minums; drops; *qatre*; *boonden.*

Molasses, uncrystallised syrup drained from raw sugar during process of refining; loosely treacle *or rab, sheera.*

Mongoose, or **Mungoose** A flesh-eating animal of the civet family; in India 18 in. long; *neola*: destroys snakes and rats.

Mortar.—Mixture of dehydrated lime and sand with water in a paste form. Hardening due to loss of water and absorption of carbon dioxide from air. Hydraulic mortars set under water. Also a *kharal.*

Mordant.—A dye or pigment fixer, *e.g.* alum. soda, potash, mayin (a kind of Indian galls), turmeric (chawan variety), etc.

Morphia, or **Morphine,** principal alkaloid of opium about 10% of the whole quantity taken;

crystallises from an alcoholic solution of opium in small crystals ; gives sulphate tartarate, hydrochloride salts; brings sleep ; injected hypodermically as one of the soluble salts.

Moss.—*Jalkumbhi.*

Mother-of-pearl, nacreous deposit with which molluscs coat rough surface inside the shells ; obtained by splitting the shells, and used for making handles of knives, buttons, and inlaying.

Mother Water.—When sea water, or any other solution containing various salts, is evaporated, and the crystals taken out, there always remains a fluid containing deliquescent salts, and other impurities. This is called mother water.

Mowah—Article given in Part I p. 38.

Mucilage, Liquid gum, prepared bv boiling or lyxviating roots, seeds or gums of certain plants.

Mulberry, *shahtoot ;* black variety prized as fruit ; white provides leaves for silk worms.

Muriatic Acid.—Hydrochloric acid, which see.

Murdonia Curculigo,—*Moosli sayah.*

Mushrooms,—*Khumbs, padbaheras, chhatris. gagandhool* etc., are fungi. They grow most on fields which have been grazed over and so are rich in manure : when the climate is close and warm. The soil containing mycelium helpful for growth. Seldom or never found in cultivated or ploughed fields. Edible variety much prized.

Musk.—*Kastoori, mushk,* aromatic deposit in the gland of musk deer : used for flavouring confectionery and in medicine as aphrodisiac and for retentivity.

A few grains of genuine musk given to a dying man bring on a short lucid interval L. Moschus maschiferus.

Musk Seeds.—B. Hibisens Abelmoschins ; *Kastoori dana.*

Mustard, *Rayi,*—A plant much grown in Northern India ; seeds of white variety used in salads ; or black variety used in condiment—*Taramira or rayi* variety used for expression of oil used in cookery ; smell very

pungent. Allied to rapeseed. Oil cake harmful to cattle. Distinguish this Indian *rayee* from the Russian *rye* which is a corn midway between wheat and barley.

Mutilla Oxida.—*Beerbohti, Kiram-i-Aroosak. Cochineal.*

Mutton Tallow.—*Bher bakri ki charbi.*

Myrabolans, *amla*—The greenish fruit of tree that grows, wild on hill sides; used for making jam, pickle, and black ink; hair oil, hair-dye; *sherbat* cooling and refreshing; fruit used in any form strengthens the nerves and the heart. Prov. *Amle ka khaya aur bare ka kaha peecchhe yád átá hai*; the taste of myrobolan and the advice of a wiseman are felt only in due course. B. Terminalia Chebula Retz.

Myrrh *gandhras.*—A fragrant resinous gum from a tree in Arabia; *murmaki, bol,* used as perfume and incense, and as tonic in medicine. It is two-thirds resin, and one-third gum.

Myrtle, *Menhdi.*—An evergreen plant, with white flowers, and sweet smell, cultivated in India for its leaves, which on being crushed yield the *henna dye.*

Myrtus Cimmuni, *Huballas.*

Naphtha,—A group of hydrocarbons distilled from shale oil, cannel coal, coal-tar, bituminous coal, or petroleum. Composition varies Inflammable, volatile liquids, dissolve fats and oils. Paraffin a constituent.

Napthalene,—A white, crystalline, solid hydrocarbon used for preserving warm clothes and books from insects. It is obtained from coal-tar.

Narcissus,—*Nargas.*

Narmah,—Silk cotton tree; *simbal ka drakht.* In popular language long staple cotton.

Narcotics—Induce sleep, intoxication, paralysis, coma or in large doses even death. In small doses they act as stimulants. Examples: opium and its alkaloid morphine; *dhatura*; *bhang* (canabas indica); belladonna and its alkaloid atropine; chloral hydrate, alcohol.

Nascency.—The newly born condition of a compound or element when it is usually more active: *e.g.*, in bleaching: chlorine from bleaching powder mixes

with the hydrogen of the moisture. The nascent oxygen thus set free from the attaching moisture attacks the colouring matter. This accounts for many phenomena that take place at one stage in the beginning but fail to have any effect later on.

Nectarine,—Smooth-skinned type of peaches grown in glass houses or in protected places. *Baggu-goshas.* Also the name of a medicine.

Neutralization,—Reducing an acid or an alkali to a salt by adding to it the required amount of alkali or acid respectively. The neutral salt should have no effect on either colour of litmus, on that of cabbage, or on the thin peel of black carrots.

Neutral,—A salt is neutral when it produces its action neither on red nor on blue litmus.

Natron,—Sodium carbonate.

Neroli,—The essential oil of the bitter orange; much used in perfumery and in soap-making.

Nees.—Adhatoda Vasica, *Bakas, Vasaka, Aroosa.*

Nees.—Andrographis Paniculata.

Nicotine.—A peculiar principle obtained from the leaves and seeds of tobacco by infusing them in acidulous water, evaporating the infusion to a certain point, adding lime to it, distilling, and treating the product which comes over with either. A single drop of it will kill a dog.

Nightshade,—A plant including the deadly nightshade from which belladonna is derived.

Nitrates,—The salts of Nitric Acid, e.g., sodium nitrate (Chile saltpetre) and potassium nitrate. Chile saltpetre obtained from the rainless districts of South America, purified by crystallisation ; used as fertiliser and chief source of nitric acid.

Nitrate of Silver,—See p. 385.

Nitric Acid,—Aqua Fortis ; colourless fuming liquid ; prepared by distilling sodium nitrate with sulphuric acid. Alternatively it may be obtained by passing air mixed with ammonia gas over heated platinum wire-guaze. Ammonia is oxidised and nitric acid is collected. The acid is a powerful oxidising agent,

important for explosives and dyeing industry and for etching or seperation of copper. *Shore ka tezab.*

Nitrites.—Combinations of the nitrous acid with the salifiable bases, alkalies, earths, and metals.

Nitro-benzene, a substance produced by the action of nitro-sulphuric acid on benzene: useful in making analine.

Nitro-cellulose is obtained by the action of nitric acid on cellulose; the action of nitro-sulphuric acid on cotton produces gun-cotton.

Nitrogen,—A colourless, odourless and inert gas, forming four-fifths of the atmosphere and entering into many compounds. Obtained commercially by liquification of air from which it is first to evaporate. The gas thus set free is made to combine with hydrogen to produce ammonia.

Nitro-glycerine,—A powerful explosive in impure state made by adding glycerine slowly to sulphuric acid, 4 parts, and nitric acid, 1 part; sp. gr. 1–6; appearance oily. Mixed with kiesulguhr forms dynamite: essential for the manufacture of cordite. See also p. 323.

Nitration,—The process by which strong nitric acid is introduced in chemicals to form the nitro group.

Nitre,—Potassium nitrate, *shora,* obtained from *kallar* land by lyxviation, decantation, concentration, crystallisation.

Nitro-Muriatic Acid. *Aqua Regia.* A compound formed by mixing 1 part of hydrochloric to 2 of nitric acid. This compound has the property of dissolving gold and platinum, which neither of the acids will separately do, (unless assisted by electricity). Sometimes the proportions of the acids are reversed from those given above, or otherwise regia may also be made by dissolving nitre in hydrochloric acid. See also p. 242.

Nitro-Sulphuric Acid.—A compound of the nitric and sulphuric acids, which may be also readily obtained by dissolving 1 part of nitre in about 10 times its weight of sulphuric acid. This dissolves silver at a temperature below 200. It scarcely acts upon copper,

lead, or iron, unless diluted with water. It is therefore useful in separating the silver from gold plate articles.

Nitrous Acid.—An acid which differs from the nitric by having a fifth part proportionably less oxygen, consisting of 1 atom of nitrogen and 4 parts oxygen, by being of an orange colour, and producing orange fumes, rendered darker by increase of temperature. It may be obtained by distilling the dry nitrate of lead, or by pouring nitric acid on copper.

Nitrous Ether,—The chief constituents of sweet spirit nitrous ether, obtained by heating alcohol with copper and nitro-sulphuric acid ; volatile and inflammable liquid.

Nitrous Oxide.—Laughing gas ; inhaled produces twitches of the facial muscles.

Nitro Lime.—Calcium cyanamide.

Nordhausen Sulphuric Acid.—An unstable fuming sulphuric acid.

Non-metals.—Usually brittle solids having no lustre, bad conductors of heat and electricity ; their oxides forming acids with water, *e.g.*, carbon, sulphur, phosphorus, oxygen, hydrogen, chlorine.

Nuphar.—Lotus flower, *neelo far*.

Nutmeg. *Jaiphal, jauz boya.* —A tree, native of Moluccas ; strongly aromatic, used as spice ; the nut yielding 3% oil, strong heart stimulant, and 25% nutmeg butter. For Essence of Nutmeg. See Part I, p. 54.

Nux Vomica. *Kuchla, azraqi.* Crow fig, the seed of a tree growing in India ; source of alkaloids, strychnine and brucine ; tincture and extract a tonic in dyspepsia in small doses ; made into rat poison with wheat meal. B. Strychnos Nux-vomica.

Oak.—A tree growing on the lower heights of the Himalayas, and in England, with rugged bark, oval leaves with sinuate edges ; wood hard and durable, used chiefly for ship-building ; bark gives tannin. Ver. *ban* or *van*.

Oatmeal.—Made by grinding the kiln-dried oats *i. e., mandwa* or *gowara*. See next,

Oats.—*Mandwa, gowara.* A plant harder than wheat; invaluable food for horses; source of oatmeal: green pods make a delicious dish; buffaloes fed on the oats grow fat, yield more milk, but lose effective strength.

Ochre.—A genus of earths, slightly coherent, and composed of fine, soft, smooth particles, easily miscible with water. These earths are of great value to the artist and the house painter. They are of various colours, yellow, red and brown. The following well known paints are different varieties of ochre: Bole or Armenian bole, terra sienna, red, yellow ochre, Spanish ochre, stone ochre, etc., *Gajni; multani mitti, peeli mitti; hirmachi.*

Oil.—An unctuous, inflammable substance, drawn from various bodies, both animal and vegetable. From the peculiar properties of different oils they are naturally divided into two kinds; the fixed or fat oils, which make and leave a greasy stain upon paper, and the volatile or essential oils, which leave no stain. The former demand a high temperature to raise them to a state of vapour, *i.e.*, to the point of ignition or flash point but the essential oils are volatilized at the temperature of boiling water, or even at a lower one. Both the fixed and essential oils may be obtained from plants, and often from the same plant. For example, almonds yield, by pressure, a bland, limpid oil, similar to salad oil; and by distillation an oil strongly impregnated with prussic acid, and having the strong smell and taste so perceptible in the stones of fruits from the abundance of the acid they contain. The chief oils used for burning and soap making are train or whale oil, sperm oil, and seal oil. Those used to lubricate machinery are mostly olive oil, seal oil, nut oil, castor oil, and sometimes the oil of lavender. The perfumer and confectioner have occasion for rose oil, neroli, the oils of cloves, cinnamon, carraway, peppermint, lavender, and others of the essential oils.

Oil Cake.—*Khal, khali.* The residue after extraction of oil from oil seeds. Many varieties contain oil up to 8 per cent. Most cakes used for feeding the cattle and for manuring the field.

Oil Cloth.—See Linoleum.

Oil Colours.—Colours mixed or miscible with oil, to which they give a body and a tint; they are either transparent or opaque. The transparent colours are the lakes, Indian yellow, sap green, indigo, Prussian blue, asphaltum, sienna both burnt and raw, burnt ochres, the chromes, vermillions, smalt, most of the copper greens, Naples yellow, most of the blacks, red lead, and numerous others.

Oil Gas.—A bi-carburet of hydrogen, obtained by the destructive distillation of oil and fat of various kinds. It has several advantages over coal gas as the apparatus is less expensive, the gas free from sulphur, and possesses a double illuminating power.

Oil of Vitriol.—See Sulphuric Acid.

Oil of Bitter Almonds.—Benzaldehyde, which see.

Oil of Garlic.—Allyl sulphide.

Oil of Mirbane.—Nitro-benzene, which see.

Oil of Mace.—Oil of nutmeg.

Oil of Mustard.—Allyl insothiocyanate.

Oil of Pears.—Amyl acetate.

Oil of Tar.—Creosote.

Oil of Wintergreen.—Methyl salicylate.

Oleander.—*Kaner, karabi.* B. Nerium Odorun, Soland

Oleic Acid.—A colourless liquid entering into, composition of fats and oils, extracted during saponification of olive oil with the addition of sugar of lead. Lead Oleate thus formed is treated with hydrochloric acid and distilled or by decomposing the olive oil soap with sulphuric acid.

Olibanum.—*Bisfaij, kandru.* Used as an incense.

Oleates.—Compounds of oleic acid with the bases.

Olefiant Gas.—The name originally given to what is now called bi-carburetted hydrogen, or bi-hydrocarbon; ethylene.

Olive, *Zaitoon.*—Indigenous to the Mediterranean region; cultivated for fruit which yield oil for culinary and medicinal purposes.

Olive Oil.—The cold-pressed oil is the best. The oil extracted by carbon disulphide during second pressing is used for soap-making.

Onosma brac, *Gaozuban, kahzabun*; very good for regulating the action of heart; cardaic.

Onyx.—A variety of agate; with alternate white and black or brown layers; met with in river gravels in the Deccan: used for setting in brooches.

Oolite.—Egg stone, *patther, ber, hajra hajood,* a variety of limestone; comprises 200 varieties of ammonites.

Opal.—A hydrated silicate: precious gem.

Opium,—*Afeem, Afyoon.* Dry black milky juice of the unripe capsules of poppies. When these capsules are 1½ inch in diameter, they are incised and left overnight when the exudation hardens and is scraped off. Opium is bitter, and owes its effect to about nineteen alkaloids. The most important alkaloid, morphine, is made by extracting opium with hot water, and boiling the extract with milk of lime. Dissolved in alcohol, opium makes laudanum. Opium is a drug of great importance used nearly by all systems of medicine to induce sleep, to remove pain, and to cause perspiration, as in common cold. It relieves vomiting, checks diarrhœa, and so is a constituent of camphorodyne and chlorodyne: it stops bleeding in any part of the alimentary canal, opium enema being given during excessive or colliquative diarrhœa; prescribed to prevent excessive lachrymation. Opium is taken habitually by many people in India, especially in Rajputana; in extreme cases the quantity taken being two tolas a day, although one grain is often sufficient to kill an infant, five an adult. The opium-eater is nervous and pale, and it is difficult to check his diarrhœa if once it sets in. Opium eaters must not give up the habit at once; the cure must be gradual by diminishing the quantity taken every day till in about fifteen days it should be reduced to nil. All opium-eaters must use plenty of fatty substances, otherwise their internal fat may be reduced to the extreme. Opium and powder of poppyheads form part of most aphrodisiac medicines. L. Papaver somniferum.

Orange.—A well-known fruit of the citron family. The flowers are sweet-scented and yield oil of neroli used in perfumery, and soap-making. Seville oranges are bitter and are used in making marmalade and for extraction of the essential oil of bergamot. Oil is also obtained from the peel and can be extracted by distillation. Central Provinces and Darjeeling are the home of sweet oranges. Attempts are being made to produce this variety in the Punjab. B. Citrus Ayuraptium. *Kamela libu, santra, rangtara ; meetha nimbu.*

Ore.—The native condition in which a metal is dug out from a mine. Ores generally are mixed up with sulphur, oxygen, arsenic, etc.

Orpiment. —*Hartal.* Arsenic trisulphide, often met with in nature in pure form. Made by heating arsenic with sulphur. It was formerly used as pigment and in making depilatory. Orpiment is of three kinds; *Varkiya*, consisting of shining plates and regarded the best for medicinal purposes; *ordinary variety called also tabqiya*; dull yellow in colour and used for making depilatory; *godanti* white variety, used in medicine.

Orris, Root.—*Bach.* An aromatic constituent of tooth-powder ; a cure for hoarseness; a kind of willow used for making baskets growing in marshy lands or places subject to inundations.

Osmosis.—The diffusion of fluids through membranous walls. If a solution of sugar and water be placed in adjacent compartments separated by a parchment wall, osmosis will take place, and both the solutions will continue to diffuse in each other till the concentration of sugar had been reduced to the same level as of the liquid in the adjoining compartment. Osmosis is of great practical importance in nature : the plants absorb their food from the soil in this way, and we take in oxygen and give out carbon dioxide from our lungs through osmosis.

Ovens.—May be internally or externally, fire : used for cooking or baking bread, biscuits ; they must be evenly heated. Germany has of late invented an oven which after baking loaves turns them out automatically at the rate of 1,600 per hour.

Oxalate of Lime.—Obtained by the action of *Oxalic* acid on lime.

Oxalic acid.—Acid of sugar formerly obtained from wood sorrel is now obtained by digesting sugar in about 4 times its weight of nitric acid. It is also obtained by heating sawdust (or any other carbohydrate) to 240°—260°, for about 6 hours in iron pans with caustic soda 6°/₀ and potash (40%) the proportion of wood being 50%, alkali taken being 100%. On cooling the material is thrown into iron filter boxes with wire-guaze false bottoms, and the substance washed with water; drawn through the mass by means of vacuum pump. The residue of sodium and potassium oxalate is heated while stirring with milk of lime in the iron pan. The caustic soda formed is drawn off for next charge, the insoluble calcium oxalate after washing split up by dil-sulphuric acid in wooden-lined vats and purified by crystallisation.

Oxidation.—The process of converting metals or other substances into oxides, by combining with them a certain proportion of oxygen.

Oxygen.—Oxides, Oxidation. Oxygen is the most widely diffused gas, there being one-fifth of it in the atmosphere : 88 81% in water, 44 to 48% in the crust of the earth ; colourless, tasteless ; odourless ; liquid oxygen pale blue in colour ; solid oxygen melts below —223° C. vigorous supporter of combustion : most essential for animal life ; things burn more brightly in oxygen ; iron can be burnt in pure oxygen : oxygen-hydrogen flame melts even platinum and emits dazzling light from lime ; used industrially for producing oxygen-acetylene flame for welding. Oxygen is prepared by heating any suitable oxide, preferably mercury oxide, or by heating manganese dioxide with potassium chlorate, by the electrolysis of water or by the fractional distillation of nitrogen (which see). Oxygen quite essential for the decay of dead matter : pure oxygen used when respiration is difficult as in suffocation, gaseous poisoning or when vitality runs down, prolonged respiration, however, being harmful.

Oxides.—With the exception of helium group or bromine or fluorine, oxygen will combine with every other element to form oxides.

Oxygenation.—This word is often used instead of oxidation, and frequently confounded with it; but it differs in being of more general import, as every union with oxygen, whatever the product may be, is an oxygenation, but oxidation takes place only when an oxide is formed.

Oyster.—*Sadaf, seep.*

Ozokerite.—Mineral wax, of various colours, soft or hard, derived from mines of bituminous sandstones of coal measures; makes candles on being purified, also used as insulating material with rubber.

Ozone.—The energetic variety of oxygen, combines readily with sulphides to make them sulphates; with dyestuffs to bleach them; with iodine to form iodide; with heated metals to form their oxides; found in small quantity near seaside, hill side, or in the open, especially after a thunderstorm; can be prepared by passing electric charges through a tube containing oxygen by means of an induction coil; used mostly for purification and pasteurizing drinking water.

Pacdellium muri Tribulus.—*Gokharan, gokshar.*

Pacderia Fetida.—*Gondhal, khalal, si-mamon.*

Paints.—Coloured liquids used for decorative purposes. Distinguish from varnishes which are protective veneers. Paints are mixtures of white or red lead, zinc or barium sulphate, or of other metallic bases, with boiled linseed oil and turpentine, these oils being used preferably to others on account of their drying qualities.

Pala Resin.—Colophony, *sundras.*

Palladium.—A silvery white metallic element; sp. gr. 11·4; soluble in hot nitric acid; unchanged in air, but turning into oxide on being heated in oxygen; used for coating silver, and in place of gold in dentistry.

Pale Catechu.—*Choka khair.*

Palmitic Acid.—A fatty acid of palm oil; crystalline and insoluble in water; its sodium salt gives hard soap; potassium salt soft soap.

Palm Oil.—The fatty grease from copra, extracted by boiling the fruit pulp with water, when the oil rises

to the top, and can be decanted ; used in making floral hair oils, in manufacturing artificial butters like Cocogem, in soap-making, as grease for railway axles, and along with white oil for lubricating sewing machines. When burnt it gives white light. Palm oil increases the growth of hair and so should be indicated for falling hair.

Panacea.—Cure-all.

Panicum Ital.—*Kangani.*

Papaw, *Papaya*—A tall tree with green mellon like fruit, valuable as vegetable and as digestive. Contains Pepsin. B. CariedPapaya.

Papier-mache.—Soft paper pulp, manufactured from rags of paper, by pulping and drying it and then subjecting it to pressure in the mould according to the desired pattern ; used in stereotyping, burnishing gold, in making masks, or plaster work. The uses to which papier-mache can be put are numerous.

Papin's Digester.—An iron pot or kettle, which has a cover that fits and screws on steam tight, and is furnished with a safety valve. The use of the instrument is that bodies may be subjected to a greater degree of heat than that of boiling water, whereby their digestion and solution is materially assisted. For example, bones will dissolve in water by the assistance of a Papin's digester, and yield a strong nutritious soup, almost equal to that from meat.

Paraffin.—Mineral wax, the name given to a series of saturated hydrocarbons, having the general formula $C_n H_{2n+2}$. They are gases, liquids and solids. The members of the series of highest molecular weight are solids at ordinary temperatures. Chemically they are extremely inert, being acted on by the halogen with difficulty: but they are inflammable, and burn with luminous flame. In popular language paraffin oil is the ordinary kerosene oil, obtained by distillation of shale. The shale is placed in upright retorts and heated to a dull red heat by partial combustion, a current of steam being passed through the retort during the process. As a result, illuminating gas is usually burned in the works, the ammonia water is turned into ammonium sulphate, while the oily tar is used for the production of solid paraffin, and burning

and lubricating oils. One ton of good shale usually furnishes from 33 to 35 gallons of crude oil. To purify it, it is again distilled and the distillate agitated with strong sulphuric acid, allowed to settle, and then treated with a solution of caustic soda. It is again distilled in fractions. Solid paraffin is a brilliant white solid, without taste or colour ; it is somewhat hard, and sings when struck ; is unacted by both acids and alkalies, and is insoluble in water. It is used for the manufacture of candles and vestas.—*Waverly Encyclopædia.*

Panffinum Mollis.—Soft paraffin.

Parchment.—A writing material obtained from animal skins ; used in ancient times for important and permanent documents.

Paris Blue.—Basic ferrocyanide.

Paris Green.—Copper aceto-arsenite.

Paris, Plaster of.—Calclined gypsum, which see.

Parsley.—*Ajmod* a stomachic.

Patcholy Herb.—A herb from Paris and the East Indies.

Patent Yellow.—A fused chloride of lead. It is a pigment of a fine yellow color, and considered more durable than the chromes.

Pearls,—Small globules roundish and found in several species of the oyster family, particularly of the *Myca margartifera*, a large species, common in the Indian seas. *Moti.*

Pearls, Artificial.—Small globules of thin glass,. perforated with two opposite holes. They are lined with a powder or rather a wash made of the brilliant scales of small fish called the blay soaked in liquid ammonial and isinglass. The ammonia evaporating leaves the scales adherent to the inner surface of the globules.

Peas.—*Mattar,* A leguminous plant, yielding edible seeds for dainty dishes. Seeds dried and ground into pea meal. Dried seeds cooked as pulse, small seeds being the best for this purpose.

Peach,—*Aru, shaftalu,* a tree grown for its juicy fruit, allied to cherry, apricot, almond, plum, and *khurmani*

Pear.—*Nashpati.* Soft and pulpy variety from Kashmir, called *baggu goshas* very delicious ; imitations grown about Amritsar ; country varieties very hard; turned into jam. Pear Oil is called Amyl acetate.

Pears.—Made in France and Germany by blowing small globules of glass and filling them with a solution of ammonia and fish scales.

Pears Prickly.—*Pan phal.* The pink and somewhat sour fruit of the cactus plant.

Pearl Ashes.—*Jau khar*, potassium carbonate, extracted from pot ashes by dissolving them in water, allowing the solution to precipitate attaching minerals, filtering the supernatant liquor, concentrating it by boiling, and by calcining the solid residue. Chiefly derived from wood or charcoal ashes or originally from ashes of barley stalks.

Pearl *White.*—Bismuth oxychloride.

Peepal.—*Filfal daraz, magh.* An excellent remedy for cough, especially along with black-pepper, ginger and honey.

Pencils.—Contain graphite, clay and wax ; copying variety contains an aniline ; coloured pencils tallow and wax suitably mixed together See p. 353.

Penny Royal.—An aromatic herb.

Penny Wort.—*Brahmi. booti.* Grows along water courses, excellent for brain workers.

Pepper.—*Kalimirach, filfal gard*; unripe berries of Piper nigrum ; used as spice and carminative ; enters into most Unani medicines for stomach and alimentary canal. The white variety is obtained by maceration and removal of the black skin.

Peppermint Crystal—Are obtained by distillation of the upper part of a plant, including the flowers ; made into oil, used as carminative and flavouring. See menthol.

Pepsin.—A pale yellow powder for helping the weak stomachs, obtained by drying the fresh stomach of pig, sheep, or calf ; is contained in papaw or papaya.

Perchloride of Iron.—See Ferri Perchloride.

Percolate.—To filter ; *chhanana.*

Perfumes.—The aromatic and highly volatile principle of flowers, woods, or animal products as musk. The ottoes are extracted in the West not straight from the flowers in the mass, but pressing out the juice, dissolving out the otto with alcohol, and distilling it fractionally. Artificial perfumes have been made synthetically. Benzaldehyde is as good as oil of bitter almonds; methyl-salicylate as oil of winter green; terpinol as scent of white lilac; ionone as scent of artificial violet; the last named being derived from oil of lemons. See p. 202. *et seq.*

Permanganate of Potassium.—Made first by fusing manganese dioxide with potash in air, to form potassium manganate which is concentrated and yields purple crystals. Used as disinfectant, to oxidise compounds of organic nature, for the estimation of iron and oxalic acid and for killing bacteria in wells.

Permanganate of Soda.—*Or Condy's Fluid.*—Obtained by heating caustic soda with Pyrolusite.

Permanent White.—Bariun sulphate, which see.

Persian Lilac.—Bakayan, Dek, Dharek.

Peruvian Bark.—Kachi Kunain, Cinchona.

Pellitory Root.—Same as Pyretherum. B. Anacyclus Pyretherum. *Aqarqara.* Native of Japan.

Petrol—Petroleum ether, or petroleum spirit, a mixture of light oils; distilled from petroleum at about 60° C. Specific gravity about ·7; highly combustible; used as fuel in internal-combustion engines of motor cars, etc., and as a bleaching agent.

Petroleum Oil.—*Matti ka tel.* Kerosene. See paraffin.

Pewter.—Common variety used for making mugs, plates, dishes; contains tin, 4 parts; lead; 1 part; finer quality no lead, but antimony, and a little copper and bismuth.

Pharbatis nil.—*Kaladana.*

Phenacetin.—An acetic acid derivative of carbolic acid; used as antipyretic and in neuralgic pains.

Phenol—Carbolic acid; phenic acid.

Phenyle.—See Part I, p. 135 *et seq.*

Phosgene.—Carbonyl chloride. The poisonous gas employed by the Germans during the Great War; produces violent coughing; produced by passing chlorine and carbon monoxide over animal charcoal (catalytic agent), or by treating sulphuric acid with carbon tetrachloride.

Phosphates.—The main fertilizers for the leguminous crops and for wheat etc. Sources; bones, rock phosphates, and basic slag, a byproduct from steel industry. Before using as manure phosphates should be converted into superphosphates by the action of sulphuric acid. (See Part I, p. 8.)

Phospherescence. White or coloured light given out by certain bodies without apparent combustion: e.g., by glow-worms, decaying fungi. Watch dials are made luminous in the so-called radium watches by painting the figures with Bonanian phosphorus (barium sulphide) or by Balmain's luminous paint (Calcium sulphide). See also p. 161.

Phosphorus, essential for bone-making and for general health of animals and plants; chief source, bone ash, rock phosphates; extracted from bone ash, mixed with sand and coke in an electric furnace. Crude phosphorus distils over, is collected under water and is subsequently refined.

Phosphoric Acid.—Obtained by dissolving phosphorus pentoxide (given off in burning phosphorus) in water; found abundantly in the mineral, vegetable, and animal kingdoms, combined with lime, lead, iron, etc.; may be made artificially by burning phosphorus in oygen, when phosphoric acid will remain in the state of a white powder; is soluble in water, is without smell, and with a sour taste, unites with the earths, the alkalies, and some of the metals forming phosphates.

Phosphorous Acid.—Obtained by exposing phosphorus for some weeks to the ordinary temperature of the atmosphere. For this purpose it is usual to put bits of phosphorus on the inclined side of a glass funnel, through which the liquor that is formed drops into the bottle placed to receive it. From an ounce of phosphorus about 3 ounces of the acid may be obtained.

Phylanthus emblic. *Amla. See myrobalan.*

Picric Acid.—Trinitro-phenol made by first acting on carbolic acid with strong sulphuric acid, and then treating this phenol-sulphuric acid with strong nitric acid: yellow crystals; m. p. 122° C.; sp. gr. 1.74; soluble in water, very bitter to taste; used as a dye and in making explosives called Lyddite.

Pigeon Pea.—*Arhar.*

Pigments.—Insoluble powerful colouring matters, used as bases in mixing paints; should be finely ground in boiled linseed oil for oil paints, and in gum water for water paints; black pigments; lamp black and Indian Ink—the latter made by grinding lamp black with gum mucilage; white pigments, zinc white or china white lead (zinc oxide); red pigment, vermillion, Venetian red, or calcined sienna (ferrous trioxide), red lead; green pigment, verdian green (hydrated chromium trioxide); yellow pigments, chrome yellow (lead chromate), cadmium yellow (cadmium sulphide); prussian blue (ferric ferrocyanide): Red, carmine and crimson lake are made by mixing cochineal with alumina or aluminium oxide; rose madder, by mixing alzarin with alumina.

Pimento.—Allspice jamaica pepper, *sarad chini, seetal cheeni,* black peppers of an American tree; used for flavouring and in medicine.

Pine.—A tall coniferous tree growing in cold temperate climates; of many varieties, some yielding edible pine cones (*chalgozas* or *neozas*); others thick white resinous gum by tapping, from which turpentine is distilled and rosin obtained as residue; others yield wood tar and pitch. All pine trees yield valuable timber that is easy to work upon, is light, takes good polish, and if well-seasoned on account of pungent oil contained in the tissues is proof against attacks of insects. Ver. *Shamshad, sanaubar deodar, devdaru, cheel, kail, partal, andhar, raye.*

Pine Apple.—*Ananas.*

Pinusdeodra.—*Devdaru, deodar.*

Pipe Clay.—A peculiar kind of white clay, used for making tobacco pipes and certain kinds of pottery. Meerschaum is also used for making the pipes.

Piper Chevya.—*Chab, darchab.*

Piper Root.—*Pohkarmool Darfilfal; Pushkarmcol.*

Pips.—*Mewe ka beej.*

Pistachio.—*Pista.* The fruit of tree growing in Afghanistan etc. greenish seeds tinged with pink, aphrodisiac; used for increasing flavour and beauty of confectionery; salted pistachois relished in the Punjab.

Pitch.—Mixture of hydrocarbons and their derivatives, left on distillation of tar, oils or fatty acids; also found naturally as in Trinidad Lake; used for cementing binding coal dust into patent fuel, as a protective against bad weather and water, alone or in the form of black varnish. Also *ral.*

Plantago.—*Eesabgol, Fleewort.*

Plaster of Paris.—Calcined gypsum, which see.

Plate Glass.—The fine kind of glass cast in thick plates, and used for looking glasses, the better kind for windows, etc. Its composition is 300 lbs. fine sand, 200 lbs. soda, 30 lbs. lime, 2 lbs. manganese, 3 ounces cobalt azure, and 300 lbs. fragments of good glass.

Platinum. A noble metal; white, soft, and malleable; can be welded at white heat; m.p. above 1700° C., sp. gr. 21.42. Nitric or muriatic acid has no action; hot caustic alkali corrodes; tin and lead fuse with it and so articles containing their alloys must not be heated. Used for making wires, foils, standard weights, as catalytic agent.

Plumbago.—*Chitrak, cheetar, shaitraj.*

Plumbago or Graphite.—The chemical name of black lead. It is a carburet of iron, containing 95 parts of carbon to 5 of iron. It is fusible, and burns with great difficulty. It is of an iron grey colour, metallic lustre, soft to the touch and easily scratched. (See Black Lead).

Podophyllin.—The powder resin of yellowish-brown colour derived from the may-apple tree of America: used in billiary complaints; taste bitter; smell unpleasant.

Pomegranate.—B. Punica Granatum. *Anar, Daeim; Darmi.*

Poppy.—*Post, koknar.* The pods of a plant grown in India and China for opium; a narcotic; decoction, rapid cure of cold in the head.

Portland Cement.—See Cement. p. 62.

Portland Stone.—An alkaline sandstone of a dull, whitish colour, heavy, moderately hard, and composed of large roundish grit. It is one of the numerous varieties of oolite. It is soft when first taken from the quarry, but afterwards acquires considerable hardness. It is much used in building. The greater part of Westminister Bridge is built with it.

Potash.—*Jaukhar.* In popular language all potash salts, *e.g.*, sulphate, carbonate and chloride of potassium. It is protoxide of potassium. It is called the vegetable alkali from its strongly alkaline properties, and its being inherent in vegetables, from whence it is obtained by burning them, and lixiviating the ashes, and afterwards concentrating the lixivium which contains the alkal by boiling and leaving it to crystallize. Potash is solid when dry, rapidly deliquesces in a moist atmosphere, is soluble in half its weight of water; soluble also in alcohol. It destroys all animal textures, changes most vegetable blues to green, and the yellow of turmeric to brown.

Pottassio-tartarate of Soda.—Rochelle salts.

Potassium.—Shining, silvery white, soft metal, lighter than water, with which it burns to produce caustic potash; obtained from caustic potash by electrolysis. It is the base of potash; first procured by Sir H. Davy, by submitting pure potash in small quantities to the action of a powerful galvanic battery, when the potash became decomposed, yielding oxygen to the one pole, and potassium to the other. Potassium is so soft as to be cut easily with a knife. A grain of it dropped into water, or suspended in a jar of oxygen gas, so rapidly unites with the oxygen, as to burst into flame, becoming at the same time, in the one case, the protoxide; and in the other, the peroxide of potassium. It melts at 150°; is considerably opaque, and a good conductor of electricity. It combines not merely with oxygen, but with chlorine, iodine, hydrogen sulphur, and phosphorus.

Potassium Bichromate.—*Surakh kâhi*. Used in bichromate cells and in colouring the walls green.

Potassium Carbonate. See Part I, p. 386.

Potassium Chloride.—Formed by neutralizing caustic potash with hydrochloric acid.

Potassium Cyanide.—Obtained by heating pot-ferrocyanide.

Potassium Permanganate.—See Part I, p. 386.

Potassium Phosphite.—Obtained by the action of potash or potassium carbonate on phosphoric acid.

Precipitated Chalk.—See Part I, p. 249.

Prickly Pear.—See Cactus.

Prince Rupert's Drops.—Drops of green glass, suddenly cooled by letting them fall into water. As soon as the small end is broken off, they immediately fall into dust, with an explosion. The exact cause of this has never been satisfactorily explained.

Prince's Metal or Prince Rupert's Metal.—An alloy of 3 ounces of copper to 1 of zinc.

Printing Ink.—The ink used by the printer. It is of two kinds: one used by the copper plate printer and the other by the type printer—each kind being made of various colours. Copperplate ink is mostly made extemporaneously by the printer, of Frankfort black, mixed with drying linseed oil, or linseed oil boiled until it is quite thick and brown. Lithographic printing ink differs in no respect from the letter press, except in being used of different degrees of thickness, according to the work to be executed. For a fine ink, adapted to letter-press work, Mr. Savage gives the following recipe:—Balsam of capavi, 9 oz.; lamp black, 3 oz.; indigo and Prussian blue, together $1\frac{1}{4}$ oz.; dry yellow soap, 3 oz.

Proof Spirit.—Spirit containing 49·28% absolute alcohol; every 0.5 degree above that counted as one.

Prussian Blue.—Made by heating dried blood or any other animal matter with an equal weight of pearlash, till reduced to a paste: then dissolving the residue in water, filtering and mixing with a solution

of 1 part of proto-sulphate of iron, 2 of alum. The green precipitate absorbs oxygen from the air, and it is thence tinged to the pretty colour.

Prussic Acid. *Hydrocyanic Acid.* Present in bitter almonds and in stones of peaches. Very poisonous. A compound of hydrogen and cyanogen. It is clear, limpid liquid, of a strong pungent odour, very like that of bitter almonds, in which, as well as in other species of stone fruit, it is found. Its taste is acrid, and it is highly poisonous, so that the utmost care should be taken to avoid inhaling its vapour. It volatilises so rapidly as to freeze itself when a drop of it is placed on a glass plate. It feebly reddens litmus. It is decomposed by means of the metallic oxides, and water and a metallic cyanuret are the result.

Precipitation.—The process of the insoluble matter settling down from its solution.

Pterocarpus Santilines.—*Lal Chandan : Sandal Ahmar.*

Ptyalin.—The essence of saliva : *thook ya luab-i-dehin.*

Pulse Glass.—A little instrument to show the effects of heat. It consists of a small glass tube, with a bulb at each end, and partly filled with coloured spirits of wine, the space above the spirit being void of air. When this tube is held in the hand obliquely, a small bubble of air remaining in the lower ball, the heat of the hand will expand the air in this bubble, and its escaping into the vacant space above with a pulsatory motion, occasions the instrument to be called a pulse glass, though it has no reference to the state of the pulse. If the glass be made in the shape of a special tube, the liquid will appear to boil rather than rise in pulsations.

Pulped.—*Gudda bana hua.*

Pumice.—Lava consisting of silica and alumina : colours different ; lighter than water ; used for polishing marble, ivory, wood, and for the toilette. It is a porous substance, procured from the volcanic countries, and generally considered as the result of volcanic eruptions. It is used chiefly as a polishing powder, when ground, or as a material to smoothen the surface of painted work, etc., used in a lump.

Pumpkin.—*Kaddu, kashi phal, halwa kaddu. Green variety called petha turned into jam and sweets.*

Puncaria Coagulens.—*Kakra, aroosah, darparch.*

Purging Cassia.—*Amaltas, khyar shambar.* B. Cassia Fistula.

Purple of Cassius.—Gold thrown down from its solution in aqua regia metallicum.

Putty is made by triturating whiting with 18% oil of linseed, with or without white lead; used for fixing glass panes.

Purging Croton.—L. Croton Tiglium, *Jamal gota, jabbolota.* A very drastic purgative.

Pyretherum.—*Aqarqara.* The bitter twigs of a plant: powder used for allaying toothache, and as bed-bug powder. *Habitat, Japan.*

Pyridine.—A basic compound derived from coal-tar and from bones, used for denaturing spirits.

Pyrites of Iron or Copper.—Iron variety in colour; employed for the manufacture of sulphuric acid.

Pyrogallic Acid.—An acid distilled from gallic acid at temperature of 410° to 420° F. If the heat exceeds this, another product called the *metagallic acid* is obtained. It is in the form of brilliant white crystals, very soluble in water, alcohol, and ether; and slightly reddening litmus. Don't confuse it with the next.

Pyroligneous Acid.—It is vinegar produced by the destructive distillation of wood, particularly of birch and beach. The wood is placed in retorts, similar to those used in the gas works, and the retorts being heated, the acid passes off by a pipe connected with the retorts, and passing through a wormwood condenser or refrigerator is cooled, and collected in a vessel beneath. The retort holds about 8 cwt. of wood, which yields about 35 gallons of crude or impure acid; the weight of this is 300 lb. It is rectified by a second distillation. It is used as a household vinegar; and for numerous other purposes. Don't confuse this with the preceding.

Pyrogallol.—The pyro of the photographers who use it in developing; obtained by heating the gallic acid.

Pyrolusite.—A black mineral, mined in C. P. etc. See Manganese Dioxide.

Pyroxylin or collodion cotton.—Prepared by saturating cleaned cotton wool in nitro-sulphuric acid and afterwards washing it; inflammable; soluble in a mixture of alcohol and ether; used in the manufacture of collodion, smokeless powders, and celluloid.

Quart.—About 1 seer.

Quartz.—Silica dioxide. Common varieties, sand and sandstone, used for making lenses, pebbles, pivots, balance fittings.

Quassia.—Bitter chips; the bitter wood of America, yielding a bitter tonic.

Quick Lime.—*Anbujha chuna.* Pure calcium oxide, calcined limestone, *kankar*, or marble.

Quinine.—One of the alkaloids obtained from Peruvian bark or cinchona tree; extracted with sulphuric acid, and separated from other alkaloids by fractional crystallisation; soluble in dilute sulphuric acid; taste very bitter; antidote in malaria; tonic and antipyretic.

Quicksilver.—Mercury, *părad, pără, seemab*; liquid metal; occurs pure, or as mercury sulphite (cinnabar or *varqiya shingraph*) from which it is extracted by calcining the ore and condensing the vapour; occurs in Austria, Spain, California. Impure mercury can be purified with nitric acid dilute or by distillation; M.P. 38.8; B.P. 357.2° C. sp. gr. 13.59. Used in polishing mirrors; in dissolving gold and silver; in mercury vapour lamps; in electrolytic manufacture of caustic soda; in making amalgams for the rubbers of electrical machine; for filling in the barometers and thermometers; calomel is mercurous chloride, made by subliming mercury with mercuric chloride; tasteless white powder, insoluble in water; used as purgative. Mercurous nitrate can be made by dissolving mercury in cold dilute nitric acid. Mercuric chloride, or corrosive sublimate, a deadly poison and antiseptic, is obtained by heating together sodium chloride and mercuric sulphate.

Quinol.—Hydroquinone.

Q.S.—Sufficient.

Raddish.—*Mooli.* A bitter salad.

Radium.—A radio-active element, derived from uranium.

Raisins.—Dried grapes; *Saugi, kishmish,* used as dried fruit.

Rancidity.—The change which oils and fats undergo by exposure to the air, becoming sour and disgusting.

Rape.—A plant of the cabbage family. The seeds yield rapeseed for colza oil; nearly smell-less; sp. gr. .915, used along with kerosene oil in cycle lamps and as lubricant; also for soap-making; in India for frying in cookery.

Rapeseed Oil.—*Toriya or tare meere ka tel.*

Re-agent.—In the experiments on chemical analysis, the component parts of bodies may either be ascertained in quantity as well as quality, by the perfect operations of the laboratory; or their quality alone may be detected by the operation of certain bodies called re-agents or tests. Thus the infusion of galls is a re-agent, which detects iron by a dark purple precipitate; the prussiate of potash exhibits a blue with the same metal, etc.

Realgar.—*Manchhal, lal hartal,* Arsenic disulphide, red orpiment, makes an explosive with potassium chlorate and is used in crackers.

Rectified Spirit.—The spirit that has been purified and strengthened by redistillation; contains 90% alcohol.

Red Chalk. Red Ochre. A kind of clay ironstone.

Red Chromate of Potash, Potassium Bichromate, which see.

Red Coral.—*Moonga.*

Red Fire.—This splendidly coloured fire, used in numerous ornamental fireworks, and in imitative conflagrations at theatres, &c., is made by mixing intimately together dry nitrate of strontian, 1½ oz., ; sulphur, 3 drachms and 6 grains; chlorate of potash, 1 drachm and 10 grains; sulphuret of antimony, 2 drachms and charcoal,

1 scruple. The following receipt is as good and more simple :—Nitrate of strontian, 1 oz.; chlorate of potash, 3 wts.; charcoal, 3 wts.; and pulverized gunpowder, 3 wts. The chlorate of potash must be powdered by itself, and mixed carefully and gently with the other ingredients afterwards, or the whole will explode.

Red Lead.—*Siandoor* lead oxide, minium; used in paints, for pottery glazes, in plumbing, and in making flint glass; made by heating lead or litharge at a temperature of 350 to 500°C.

Red Liquor.—Employed in calico printing, and prepared from pyroligneous acid. It is aluminium diacetate in solution.

Red Precipitate.—Mercury nitric oxide.

Red Pans.—A mixture of the chloride, sulphate and carbonate of sodium, a white efflorescence, used for cleaning by washermen.

Red Saunders.—A dye drug; the wood of the pterocarpus santolina. *Rakta chandan, sandal-i-ahmar, also resin pitch, ral.*

Resins.—Exdutions from certain plants, lac, copal, *ral*, gum mastic, *jalan*, *balsam*, etc. They are soluble in alcohol, ether, alkalies and essential oils. Used in making varnishes, soaps, sealing-waxes and in sizing paper.

Resorcin.—A colourless crystalline substance ($C_3H_6O_2$), made by heating benzene with sulphuric acid; fusing the resultant with caustic soda soluble in water, alcohol or ether and a photographic developer, used as dyestuff, and in medicine.

Rhodium.—Rosewood; scented wood of Canary convolvulus.

Rhododendron.—*Gulabashi*.

Rhubarb.—*Reond, reondchini*, the leaf stalk of English variety boiled with sugar, a favourite food; the dried roots of the China variety used as a stringent tonic in small doses and as purgative in big doses. Gregory's powder contains rhubarb, magnesia and ginger. B. Rheu Emochi.

Rhus Kakrasingi.—*Kakrasingi*.

Ricinic Acid.—An acid obtainable from the ricinus communis, or castor seeds, *Tezab bed Anjeer.*

Ricinus oleum.—Castor oil, q.v.

Rind.—*sakht chhilka.*

Rinsed.—*Dhoya hua, shusta.*

Rochelle Salt.—Tartarate of potash and soda.

Rock Candy.—Brown *misri.*

Rock Crystal.—Very pure quartz or silica.

Rockets.—Composition for small rockets may be filled with a composition of meal powder 1 lb. 4 oz.; saltpetre 4 oz.; and charcoal 2 oz. For large rockets, take meal powder, 1 lb.; slatpetre, 4 oz.; brimstone, 3 oz.; charcoal, 1½ oz.

Rocket, Rains for: Golden rain—Saw dust 1 oz.; sulphur 2 oz. glass dust 3 oz.; nitre 8 oz.; and meal powder 2 oz.

Silver rains.—Nitre, ½ oz.; sulphur, 2 oz. and charcoal, 4 oz. Ram it into small cases.

Rocket. *Stars for.* Nitre, 1 lb.; sulphur, 4½ oz.; sulphuret of antimony, 1 oz.; isinglass, ½ oz.; camphor, ½ oz.; spirits of wine, ¾ oz. White Stars:—Meal powder 3 oz.; nitre 16 oz.; sulphur 4 oz. Blue Stars:—nitre, 4 oz; meal powder, 8 oz.; sulphur, 2½ oz. Crimson Stars:—Sulphur, 1 oz.; sulphuret of antimony, 1 oz.; chlorate of potash, 1 oz.; and nitrate of strontian, 5 oz. Make into a paste with spirits of wine and isinglass, and cut up into small pieces.

Roman Cement.—A species of lime, which when mixed with river sand soon consolidates into an extremely hard concrete, or mortar, which is valuable in building, to imbed the brick and stone-work, for foundations, as a lining for reservoirs, and particularly as a covering for buildings, defending them from the weather. See also Portland Cement.

Rontgen,—Or X-Rays are given out by radium or an air bulb exhausted of air and provided with electrodes when an electric current is passed through it, and can penetrate material objects opaque to light, and has power of affecting a photographic plate, and of producing phosphorescence on a screen coated with

barium platinocyanide; employed in surgery for locating the fracture or any embedded foreign body, in checking the growth of cancer and in completely curing rodent ulcer; in reducing the scrofulous glands, the swoollen spleen.

Rose.—Rosa Damascena, Mill. *Gulab.*

Rosemary.—A flower of Asia Minor and China.

Rose. Pink.—A pigment made by dyeing chalk or whiting with a decoction of Brazil wood and alum.

Rose Wood.—A fine dark grained wood, which when fresh cut has a sweet rose like scent. It is much used for cabinet work, picture frames, &c.

Rosin.—Colophony, Resin, residue of crude exudation from many pine trees when turpentine has been distilled; used in making sealing-wax, varnishes, sizing paper, shoe-makers wax, and for soap-making, and in the manufacture of phenyle: m. p. upwards 100°C. *Sundras, sookha behroza.*

Rot, Dry.—A highly destructive vegetable disease, affecting the timber in the foundations and other parts of buildings in particular soils and situations. It affects the wood in such a manner as to leave it connected by nothing but small, hard, fibrous portions, but all of which, when touched by the hand in the more advanced stage of the disease, readily moulder into a brown snuff like dust. It is with a peculiar earthy smell, and has been supposed to rise from various causes. It is now clearly proved to be occasioned by the growth of a peculiar vegetable substance or mould, called *merulius lachrymans*, the spores or seeds of which are usually present in most timber, but only germinate when under the joint influence of moisture and warmth. To preserve timber from this destructive pest, it is necessary to imbue it with some substance which acts as a poison to the dry rot. That which has been found most efficacious for this purpose is a solution of corrosive sublimate; this is called Kyan's Preservative, and the soaking of timber in it is usually known as Kyan's process.

Rotleria Tinctoria.—*Kameela.*

Rotten Stone.—A soft stone, used for polishing.

Rouge.—A beautiful red coloring matter, supposed to be of an acid nature, which is extracted from the safflower, by soaking it in a solution of the carbonate of soda, and afterwards neutralising the soda by lemon juice. See p. 185.

Ruby.—A red precious stone: it is a kind of corrundum; more valuable than diamond; small artificial rubies of insignificant value have been made by fusing alumina and oxide of chromium, See pp. 308, 314.

Ruby Copper.—Native oxide of copper.

Rum is distilled from fermented molasses, (inferior quality from diluted grain spirit). To either ethyl acetate and butyrate are added for flavouring. This is the country made cheapest liquor.

Rupert's Drops.—(See Prince Rupert's Drops.)

Rusa Grass. E. J. Geranium.—L. Cymbopogon Wartini Stapf. *Rosha.*

Rushes,—*Balchhar, billi loton :* a fragrant grass used in perfumery and in making. *havan samigri.*

Saccharin.—Derived from toluene, a coal-tar byproduct ; 500 times as sweet as sugar, but has little or no food value ; does not disturb digestion and so employed for diabetics.

Saccharometer.—An instrument for ascertaining the strength of worts, or infusions, in the preparation of malt liquors for beer, or distilling spirits. It differs in no respect whatever either in form or use from the hydrometer. (See Hydrometer). It is graduated from 0 at the top to 100. When immersed in distilled water, at the temperature of 70, it stands at 0 but rises higher and higher in proportion to the strength, or rather the specific gravity of the liquid in which it is immersed.

Safflower.—A dyeing material for the making of rouge, and giving a pinkish bloom to lavender and other coloured silks ; also the material with which pink saucers are filled. It is often sold in small compressed cakes, which are formed of the petals and stamens of the carthamus tinctorious. *Kusumbi, muasffar.*

Saffron.—*Záfran* : *kesar* ; vegetable product from Kashmir used in cookery and in medicine as a stimu-

lant. *B. crocus sativus.* Its filamentous cake is composed of the stigmata of the flowers of the *crocus sativus.* Saffron is also used in cookery, and to give a colour to certain confectionary articles, liquors, and varnishes, but rarely as a pigment, though as a water colour it might be used with advantage, particularly in the artificial formation of greens. The price of saffron having risen the confectioners in India now use harmless colours.

Saffron of Antimony.—Sesquisulphuret of antimony.

Saffron of Mars.—*Crocus marits,* or the red peroxide of iron.

Salad Oils.—Strictly speaking, salad oil is the name given to olive oil which is largely employed on the shores of the Mediterranean for dressing much in the same way as we use *ghee* in India. Recently, however, other vegetable oils, e.g, Arachis oil (Nut Salad Oil): Sesame oil (Fresh salad oil ; cotton seed oil, and even sunflower oil, poppy oil, and maize oil are taking the place of the olive oil). In India mustard (karwa) oil and cocoanut oil are much in vogue.

Sal Ammoniac. or **Ammonium Chloride.**—*Naushadar,* formerly prepared in this country by condensing the fumes arising over brick-kilns which were stuffed with street refuse and night-soil ; now by neutralising ammonia from gas works with muriatic acid ; sharp saline taste ; crystalises in white needles that conglomerate ; sold in the bazar in tablet form ; solubility at 10°C. 32 8 in 100 parts of water ; used in soldering, in coating utensils with tin ; in dyeing, in Leclanche cells ; in making dry batteries, and as expectorant and as antibiliary in medicine.

Salicylic Acid.—Ortho-hydroxy-benzoic acid ; an aromatic, colourless, smell-less, light substance ; taste at first sweet, later on sour ; used externally as antiseptic and internally for rheumatism ; source of about 60 dyes ; aspirin made with it by the action of acetic acid.

Saliva Plebia. *samundrasokh.*

Salix Capua.—*Bed mushk.*

Salol.—Phenol salicylate ; a colourless and almost tasteless drug : an external antiseptic ; given internally

as mouth wash and to kill intestinal worms or to disinfect the urinary tract.

Salep, or **Saloup.**—Is the name of the dried tuberous roots of the *orchis* imported from Persia and Asia Minor. They are the product of a great many species of the plant but especially of the orchis mascula. *Salib* ; *saleb misri.*

Sal Soda.—Ordinary washing soda, sodium carbonate.

Salt.—The neutral substance got by the interaction of an acid on a base ; alkali, or metal. See next three.

Salt. Ammoniacal ; fixed Chloride of lime.

Salt Common.—Sodium chloride, obtained from mines, salt lakes or sea ; sp. gr. 2.16 ; m.p. 815 ; solubility at 20°C., 35.94 ; little difference in solubility in hot or cold water ; hygroscopic property due to admixture of magnesium chloride ; other impurites : sodium or calcium sulphate. Used in food, for curing fish, in manufacturing hydrochloric acid and chlorine, in freezing mixtures, and in the manufacture of caustic and washing sodas.

Salt Black.—Is an admixture of common salt and pink barilla. Large quantities made at Lalamusa.

Salt, Spirits of.—Popular name for hydrochloric acid.

Salt Cake.—Crude sodium sulphate in Leblanc Soda-process.

Salt of Amber.—Succinic acid.

Salt of Chrome.—Potassium chromate.

Salt of Lemon.—Potassium hydrogen oxalate.

Salt of Soda.—Sub-carbonate of soda ; used much in the present day by the laundress, as a detergent ; and to assist with tartaric acid in making an extemporaneous effervescing draught, or soda water.

Salt of Tartar.—Crude potassium carbonate, *Jaukhar.*

Saltpetre, Nitre.—Potassium nitrate, *shora kalmi,* m.p., 339 C. 246 at 100 C., solubility 20.9 at 10 C. in 100 parts of water ; bitter saltish taste ; generally made by reaction of potassium chloride in Chili saltpetre.

Uses almost same as those of Chili saltpetre; Ver. *kalmi shora.*

Salvia Hae,—*Bahman surkh, Bahman sufaid*

Sal Volatile,—See Ammonium chloride.

Sandalwood,—A pale sweet smelling wood from Mysore, source of sandalwood oil which is used as base for *attar*. The sandalwood oil *real* can be distinguished from those that have calol or white oil as base by evaporating a few drops on a paper over slow fire. Sandalwood oil leaves no trace behind, while the other oils produce small bubbles. Ver. *sandal, chandan.*

Sweet Chandan.—B. santalum Album. See foregoing.

Sandarac Varnish.—Is made by mixing by means of gentle heat of a slow fire, 8 oz. of gum sandrac, 2 oz. of powdered mastic, 4 oz. of clear turpentine, 4 oz. of pounded glass, and a quart of spirits of wine. The use of the pounded glsss is to prevent the other ingredients from coagulating together, and thus preventing the proper action of the alcohol. Sandarac varnish is very durable.

Sandbath.—Heating a thing over sand in a metallic plate to apply heat uniformly. Thus Grain-scorchers parch the grain over heated sands *i. e.*, they sandbathe the grain.

Sandrach,—*sundras* gum of the juniper tree.

Santonin,—A colourless or yellowish drug, derived from the buds of artemisia maritima; administered internally as intestinal antiseptic to kill round worms.

Saponification,—The reaction between the glycerides in fats and oils and the alkalies used to convert them into soap.

Saponin.—The active principle of bark, fruit, or leaves of certain plants, which cleanses like soap; e.g., the leaves of soapwort; soapnuts. (*areetha*).

Sappanwood,—B. Caesalpinia Sappan. *Patang; Bakain; Dek; Dharek; Pb. Chhamak Mamoli.*

Sapphire,—Blue precious stone; composition the same as that of ruby; second in value to diamond.

Sarac Indica.—Ashoka.

Sardines,—The preserved young ones of the herring fish.

Sarsaparilla,—Drug prepared from the dried root of an American or Chinese plant. *Chob chini.*

Sassafras,—An American tree of the laurel family, the bark being of aromatic smell and taste; fruit is used for extracting oil.

Saturation.—Saturation with one substance does not always deprive the fluid of its power of acting on and dissolving some other bodies and in many cases it increases this power. A solid is also sometimes said to be saturated; thus sand of the sea shore saturated with water and so on. The word saturation is also employed in another sense. The union of two which differ from those of its component parts; when the principles are in such proportion that neither predominates, they are said to be saturated with each other, but if otherwise, the most predominant principle is said to be sub-saturated and the other super-saturated.

Satin White,—Calcium sulphate, gypsum.

Scammony,—Ver. *Sakmonia,* gum resin of a plant of Asia Minor; strong purgative and vermicide.

Scheele's Green.—A pigment consisting of copper hydrogen arsenite.

Schists,—Rock of foliated structure.

Sedative,—Soothing; allaying irritation, a medicine producing this effect.

Sea Wax, or Maltha.—A white, solid, tallowy-looking, fusible substance, soluble in alcohol; found on the Baikal Lake, in Siberia.

Selenite,—Gypsum, which see.

Senna,—*Sennamaki,* the purgative leaves of a herb from W. India. See also Cathartin.

Sensitive plant,—*Chhooi mooi, Lajwanti.*

Sepia,—Dark brown pigment used in mono-chrome sketching: derived from cuttlefish.

Sesame,—*Til, Kunjad,* yield sweet oil of gingley, used in place of *ghee* and for soap-making.

Shaddock.—*Bijora, Sadaphal.*

Shallots.—Plant of onion kind with cloves like, but of mild flavour than, those of garlic.

Shammey, *or rather* **Chamois.**—A very pliable kind of leather, originally prepared from the chamois goat, now manufactured from the skins of sheep or lambs, and known by the name of wash leather.

Shellac.—Or shell lac. See Lac.

Sherry Wine.—A spirituous wine containing about 15% alcohol.

Shoe flower.—*Gurhal.*

Siccatives.—Driers in varnishes, etc.

Sienna.—Dull brown hydrate ferric oxide mixed with manganese dioxide and other clays; on being heated becomes brighter; used as pigment.

Silica.—Silicon dioxide, white structureless powder or crystalline quartz; soluble only in hydrofluoric acid; or in hot solutions of alkalies; m. p. about 1600°C.; at this temperature quartz glass is formed which is moulded into tubes, flasks etc.; also used in making fire-bricks, types, onyx, chalcedony, agate, flint, opal, jasper, amethyst.

Silicate of Soda.—Is prepared by fusing sodium carbonate with sand or by heating sand with caustic soda under pressure. See waterglass.

Silk Cotton.—*Simbal, Shalmali.*

Silver.—Takes high polish; best conductor of heat and electrcity; easily tarnishes in air containing sulphur or chlorine vapour; dissolves in mercury; sp. gr. 10.49; m.p. 960.5; dissolves in dilute nitric acid.

Silver Bromide.—Formed by mixing solutions of silver nitrate with potassium or sodium bromide.

Silver Chloride.—Is prepared by mixing solutions of silver nitrate and sodium or potassium chloride.

Silver Cyanide.—Is obtained by adding a soluble cyanide to a solution of silver nitrate. It is soluble in ammonia.

Silver Nitrate.—See p. 385.

Simmer.—Lie or keep at the boiling point gently.

Sisso.—*Sheesham,* Indian tallow tree. Pb. *Talhi.*

Sisymbriumiliarid.—*Khoob kalan; khaksi.*

Size.—A kind of weak glue, used in many trades. It is made of the shreds and parings of leather, parchment, vellum, &c., boiled in water and strained. The boiling is continued for six or eight hours, and of course the finer the material employed, the more transparent will be the size.

Skimmer.—*poni, mail utárne ká chamchá.*

Skunk.—*Reg mahi, retki machhi.*

Slag Basic.—*Manoor,* cinder from blast furnaces consisting principally of silicate and phosphate of aluminium and calcium, a very good fertiliser.

Slaked Lime.—Calcium hydroxide, *bujha hua choona.*

Smiler China.—*Chob cheeni.* See Sarsaparilla.

Soapnut.—B. Sapindus Trifoliatus and mukorosi Gaerth. *Reetha.*

Soap Stone.—French chalk. See Talc.

Soda.—In popular language, carbonate of soda. Washing soda is made by cooling a hot saturated solution of sodium carbonate. *Soda khurdni,* is bicarbonate of soda.

Soda, Silicate of.—Silicate of soda (or soluble glass) is prepared by fusing together carbonate of soda and sand, or by boiling flints in caustic soda under great pressure. It is not soluble in cold water, but dissolves in 5 or 6 times its weight of boiling water. It is employed in the manufacture of soap, in fixing colors, in preserving stores from decay. In admixture with other silicates of soda occurs in glass; and it, equally with silicate of potash, imparts the property of viscidity before fusion to such mixtures, which is of great value in the working of glass. See Waterglass.

Sodium.—A soft metal, lighter than water, obtained by electrolysis of caustic soda, reducing the carbonate of soda or caustic soda with carbon; sp. gr. 0.971; m.p. 97.6; b.p. 742; burns with bright yellow colours. Sodium hyposulphide, or Hypo of the photographer is thiosulphite.

Sodium Biboratis.—BORAX, which see.

Sodium Hydrate.—Caustic soda, which see.

Sodium Hypophosphite.—Is obtained by the action of phosphoric acid on caustic soda.

Sodium Permanganate.—See Permanganate of Soda.

Sodium Phosphate—Is obtained by adding phosphoric acid to sodium carbonate.

Sodium Sulphide.—*Hartal*, is obtained by cooling or freezing a mixture of caustic soda or sodium carbonate in which sulphur dioxide has been passed to the point of saturation.

Sodium Tungstate.—Is used to make fabrics non-inflammable and as mordant in dyeing.

Soft Soap is made with caustic potash.

Solaonum Indic.—*Mako.*

Soldering.—The art of uniting metals together, by fusing between them an alloy or solder. The conditions of soldering are the perfect brightness of the edges to be soldered, a solder which fuses at a less heat than the metal itself, the application of a sufficient heat to melt the solder and not the metal, and prevention of oxidation on the bright surfaces during the operation. The last is effected by laying upon the bright parts either turpentine as the jewellers do; or rosin, like the plumbers and other artizans. Sal ammonia is also very serviceable for this purpose.

Soluble Cream of Tartar, or **Sal Gummosum.**—Is made by adding 2 parts of borax to 5 of crystals of tartar, in powder, and evaporating the solution to the consistency of honey; it then concretes into the above substance.

Soluble Glass.—Sodium silicate. See Waterglas infra.

Soluble Prussian Blue.—Prussian blue is only soluble in water, when a percentage of iron is added to excess of a solution of ferrocyanide of potassium. The compound thus formed is soluble in pure water, but not in saline solutions, it consists of 1 atom of ferrocyanide of potash and 1 of Prussian blue.

Sonofsis Offic.—*Gajpeepal.*

Spanish Fly.—L. Mylabaris. *Telini makkhi.*

Spar.—In mineralogy, those minerals that break easily into crystals or laminated fragments with polished surfaces. A spar, among builders, is a large round piece of timber, fit for making masts, yards, scaffolding poles &c.

Spermaceti.—Whale fat ; a fatty matter, derived from the head of cachelot or spermaceti whale ; a white, semi-transparent substance used for making candles, ointments, etc. The bottle-nose whale yields a similar product ; a thin pale yellow liquid of sp. gr. .88, and of more or less fishy odour. It does not readily become rancid or gummy and is thus a valuable lubricant.

Sperm Oil.—Obtained from cachelot or sperm whale, or from bottle-nose whale : thin, pale yellow oil ; sp. gr. .88, does not easily become rancid or viscid, as such a valuable lubricant.

Spharanthus Moller.—*Gorakh mundi*

Spikenard.—*Jatamansi*. B. Nardostachys Jatamans

Spinach.—*Palak ka sag*, rich in vitamin D and so a wholesome potherb.

Spirits.—Distilled alcoholic liquors, *e.g.*, brandy, *arrack*. Whisky contains 55% alcohol ; obtained from fermented malted barley. Proof spirit contains 49% alcohol : Rectified spirit 85.65%. Methylated spirit. 90% alcohol, wood naptha 99% and dye 1%.

Spirit of Hartshorn.—Ammonia solution.

Spirit of Nitre.—Nitric ether.

Spirit of Salammoniac. Liquid ammonia.

Sipirit of Salt.—Muriatic acid.

Spirit, Sulphuretted.—A liquid obtained by passing a current of sulphuretted hydrogen through an aqueous solution of ammonia. It is indifferently called the hydro-sulphuret of ammonia, hydro-sulphate of ammonia, Boyle's fuming liquor, and Beguin's sulphuretted spirit.

Spirit of Tartar.—Pyro-tartaric acid.

Spirit of Turpentine. A highly inflammable and stong smelling liquor, obtained by distilling turpentine.

Spirit of Vitriol.—Dilute sulphuric acid.

Spirit of Wine.—Ethyl alcohol of any strength.

Spogel Seeds.—B. Plantago ovata Forsk ; *Isabgol.*

Squill.—*Isquil, jangli piyaz; ansal;* grows wild on the lower heights of the Himalayas *e.g.*, Mussourie hills ; makes a good poultice, B. Urginea Indica, Kunth.

Stained Glass. —When certain metallic oxides or chlorides are ground up with proper fluxes and painted upon glass, their colours fuse into its surface at a moderate heat, and make durable pictures, which are frequently employed in ornamenting the windows of public and private buildings.

Stannic Acid.—A name that has been given to the hydrated peroxide of tin, formed by decomposing the solution of perchloride of tin by ammonia. It is a bulky, white powder.

Star apple.—*Jamrol.*

Starch.—Carbohydrate from plant products : insoluble in cold, soluble in boiling water. Deep blue colour with iodine ; Ver. *Nashasta.* See p. 15.

Stearic Acid, or **Stearine.**—The solid acid made by saponifying fats with a little quantity of lime under pressure or by action of superheated steam alone ; the resultant is mixed with palmitic acid and purified by pressure ; used in candle-making.

Stewpan.—*naram ánch par pakane ka bartan.*

Stoned and quartered.—*Guthli nikal kar rezah rezah kiye hue.*

Storax.—*Salajeet*; *shilaras.* For Artificial Storax, see Part I p. 309.

Strained.—*Puna hua, chhana hua.*

Stramonium.—The alkaloid derived from the seeds and leaves of *dhatura* ; used to relieve bronchial or ashthamatic spasms. Leaves make Grimault's cigarretes.

Strontia.—One of the alkaline earths, of which strontium is the base, occuring in a crystalline form as a carbonate in the lead mines of Strontian, in Argyleshire, whence its name. The pure earth is greyish white powder infusible in the furnace, of an acrid burning taste, like that of lime, but even sharper. It becomes

hot when moistened and slakes into a powder, dissolves in 150 parts of water at 60, and in much less at the boiling point, forming an alkaline solution called strontia water. It is not poisonous. The only preparation of strontia used in the arts is the nitrate, which mixed with charcoal or gunpowder, burns with an intensely crimson colour ; hence it is used in artificial fireworks and theatrical conflagrations.

Strontium.—Metallic element of calcium group, a yellow metal ; salts used to produce red light in fireworks and in refining sugar.

Strychnine.—The bitter alkaloid from nux vomica seeds (*kuchlas*) ; tonic and stomachic in minute doses ; deadly poisonous in big doses. Ver. *sat kuchla.*

Styptic.—*Khun band karne wala* ; arresting hæmorrhage.

Sublimation.—A process by which volatile particles are raised by heat, and condensed into a crystalline mass. Zinc when melted and burned in a hot fire becomes sublimed, or flies off in a copious white powder, which is an example of sublimation. Sulphur, ammonium chloride, camphor, iodine, all sublime.

Succinic Acid.—*Acid of Amber.* Salt of Amber. Obtained by distilling coarsely pounded amber in a retort by itself with a heat gradually raised or mixed with one twelfth of its weight of sulphuric acid, diluted with half its weight of water. It is afterwards purified. Its salts are called succinates, one of which, the succinate of ammonia, is an excellent test for iron in solution. *Tezáb-i-Kehrabá.*

Sublime.—*Jauhar uráná.*

Suds.—Foamy water of soap.

Sugar-candy.—*misri tayi ki.*

Sugar of Lead.,—See Lead Acetate. For manufacture of sugar of lead, see Part I, p. 373.

Sugar of Milk.—See p. 373.

Sulphate of Ammonia.—See Ammonium Sulphate.

Sulphate of Nickel.—Formed by dissolving nickel in sulphuric acid.

Sulphate of Zinc.—*White vitriol.* This is used in drying lotions, in preparing drying oils for varnishes, and in the reserve or resist pastes of the calico printer; it is also used for eye-lotions.

Sulphoadipic Acid.—When olive oils is carefully mixed with sulphuric acid, so as to avoid the heating of the mixture, a thick brown compound is formed, from which water separates all the oil in an altered state, and retains in solution a peculiar compound of hyposulphuric acid and organic matter, which Chevreul has termed sulphoadipic acid.

Sulphocyanic Acid. Hydrosulphocyanic Acid. Sulphuretted Chyazic Acid. Sulphoro-Prussic Acid.—A triple compound of sulphur, cyanogen, and hydrogen. It is made thus. Mix equal weights of flowers of sulphur and powdered ferrocyanide of potassium, and keep the mixture melted in a flask for half an hour; when cold reduce the mass to powder, and digest it in water. Filter the solution, and add a sufficiency of liquid potash to throw down the iron held in solution. The liquid thus obtained is a solution of cyanuret of potassium, from which liquid sulpphyocyanic acid may be obtained by distillation with phosphoric or sulphuric acid. It is of a pinkish hue, with an acetic odour, and is characterized by the peculiar blood-red colour, which it produces when mixed with persulphate of permuriate of iron.

Sulphur is obtained by purifying the dust from volcanic districts; 'm.p. 114.5; sp. gr. 2.05 to 2.07; soluble in carbon disulpide; used in making matches, in condition powder, in vulcanising rubber Ver. *Gandhak.*

Sulphur Dioxide is obtained by burning sulphur in air or by the action of sulphuric acid on copper turnings by heat.

Sulphuretted Hydrogen is prepared by the action of sulphuric acid on ferrous sulphide.

Sulphur Glass, see Part I, p. 379.

Sulphuric Acid.—Oil of vitriol, the backbone of chemical industry. Almost all other acids made with its help; used in most industries; sp. gr. 1.84; b. p. 338°C. very hygroscopic and corrosive; chars organic substances. Ver. *Gandhak ka tezab.*

Sulphuric Ether.—Diethyl ether, is obtained by carefully boiling sulphuric acid with alcohol.

Sulphurous Acid.—Water solution of sulphur dioxide ; converts saw dust into sugar.

Sulphurous Anhydride.—Same as **Sulphur Dioxide,** (SO_2), under ordinary temperature and pressure a colourless gas with suffocating odour of burning sulphur. Even in diluted state causes irritation of the mucous membrane and not infrequently catarrh ; a non-supporter of combustion, only some metals can burn in it, freely soluble in water, at 32° (0°C), 69 volumes taken up. **The aqueous sulphurous acid** is unstable ; it soon takes up oxygen from the air and is converted into sulphuric acid. Sp. gr. of the gas, 2. 247 ; of liquid, 1.49 Sulphurous acid a powerful reducin;g or de-oxidising agent. Useful as bleaching agent, as disinfectant ; as a powerful antiseptic. Biggest use in the manufacture of sulphuric acid. With bases, this acid makes sulphites.

Sumach.—The name of a shrub, (*Rhus Coriaria*) which grows naturally in Spain and other places ; and the wood of which dried and pounded is used for the purposes of dyeing and tanning. In the former art it produces, when used alone, a fawn colour, when with the acetate of alumina as a mordant, a good yellow.

Sunflower.—*Suraj mukhi* ; seeds yield oil.

Superphosphate.—The mixture of calcium hydrogen phosphate (hydrated bone ash) and gypsum, made by treating bone ash with dilute sulphuric acid (Sp. gr. 1.57) ; sets easily ; contains soluble phosphates and so useful as manure ; applied as powder.

Sweet Cloves.—*Akleelul malik.*

Sweet flag.—*Bach, ghor-bach,* B. Acarus Calamus.

Sweet Oil.—*Meetha tel, rogon kunjad, tili ka tel.*

Sweet Potato.—*Shaqar qandi.*

Sweet Spirit of Nitre.—Ethylnitric.

Sylvine.—Potassium chloride.

Symlocos Racemosa. *Pathani lodh.*

Syrups.—See Part I, p. 55.

Swallow-wort.—B. Calotropis Gigante, R. Br. and Co. Procera, R. Br. *Madurakanda.*

Tacoma, Arabica.—*Dhamansa dursparsha.*

Talc., Talcum.—Magnesium silicate, Ver. *dudh pathri sang-bhata, selkhari, sang-jaraht.* French chalk. Stearite and soapstone on being powdered make French chalk; soft, white, easily abraded; used as lubricant, as filler for paper, for making tailor's chalk; for preserving rubber goods; for glazing green tea; in powder form in face powders.

Tallow.—Fat of sheep or ox.

Tallow Vegetable is a solid derived from seeds and nuts from China. Used in making candles, as lubricant and in making margarine and soap.

Tamarind.—*Imli, timar-hindi; tentul*; fruit used as food and for making *chutney.* Pith of seeds rich in nutritious starch and so must be exploited, can be turned into *halwa* with flour of water chestnut and other tonic ingredients; rather indigestible. B. Tamarindus Indica.

Tamarise.—*Jhaoo,* a tree that grows wild as shrubs on the banks of the Panjab rivers makes good baskets.

Tan.—The used up bark of tanners, from oak, *khair,* acacia, larch and other trees; used as manure and as fermenting material in making hot beds.

Tan or Tannic Acid.—Gallic anhydride, the active principle from oak galls, bark of acacia, khair, sumach, oak bark, fern roots, willows, acasia, *keekar* etc., etc., extracted by steeping and boiling in water; occurs in tea also; crystalline astringent; used in dyeing, tanning and ink-making. It has astringent properties and preserves leather from moisture. For details see p. 46.

Tapioca.—Starchy food from cassava and other tropical shrubs, the pure starch being made by pulping the roots, washing out the starch, and drying it on heated plates.

Taraxacum.—A tree of the dandelion tribe.

Tartar.—Purified argol, a deposit in wine-casks. Pure variety is known as cream of tartar, potassium hydrogen tartarate.

Tartarated Soda.—Rochelle salt.

Tartaric Acid.—*Nimbu ka sat*, obtained from the wine lees, tamarinds, or grapes, is dyhydroxy succinic acid. It is sold in large crystals or in powder. It forms salts, potassium tartarated and cream of tartar; potassium, sodium tartarate (Rochelle salt); and tartar emetic. Used in making baking powders, effervescent mixtures, in clarifying syrup, as mordant in dyeing.

Tellicherry Bark.—*Kurchi kaureya*

Tellerium.—A rare metal of sulphur family: appearance greyish-white and metallic; sp. gr. 6.2; m. p. 455°C.; b. p. 1390°C.

Terebene.—A hydrocarbon prepared by treating turpentine with sulphuric acid; used as disinfectant.

Terminelia Bellerica.—*Bahera, Halela zard.*

Terra, Cotta.—Baked earth Earth or clay was the first matter employed by artists, whether in building, or modelling; and at much more recent periods, was abundantly used for the latter purpose, and is the substance of many beautifully executed bassi relievi, of which relics and examples have been found among the ruins of Harculaneum, Pompeii, and other places. In fact it is greatly used at the present day for constructing architectural ornaments, &c., it being plastic, cheap, readily worked, and at the same time hard and durable.

Test Papers, slips of blotting paper saturated with some reagent as litmus or turmeric. Red litmus turns blue with alkali; blue litmus red with acid Neutral paper also used for both purposes. Lead acetate paper turns black with sulphuretted hydrogen; potassium iodide and starch papers turn blue by oxidising agents like chlorine, oxygen and oxides of nitrogen or by being attached to the anode or positive pole of the battery; serving as a pole finder.

Tetranthera Roxbur.—*Maida lakri; Maida sak.*

Texus, Bocatur.—*Tálees Patra.*

Thallium.—A soft lead-like element obtained from refuse of sulphuric acid, sp. gr. 11.9; m.p. 290°C.; tarnishes in the air; poor conductor of electricity.

Thorium.—A rare radio-active metal, extracted from thermonazite sands of Travancore and Brazil; sp. gr. 11.2; incandescent in air and so nitrate of thorium used in making gas mantles, the fabric being soaked in the salt and on being burnt yields the oxide, useful in allaying coughs.

Thorn Apples.—*Dhatura.* B. Datura, fruit bigger than a big lemon and covered over with thorns; the whole plant gives out a characteristic unpleasant smell; fumes of leaves antispasmodic; seeds and roots narcotic, used by *Thugs* to overpower victims. The plant grows wild in most parts of India, especially on the lower heights of the Himalayas.

Three Myrobolans—*Triphla. i. e. harar, bahera asumla.*

Thyme.—*Ajwoin* is of several varieties, *Desi, Khurasani, ajmod.* Oil extracted from *Thyme vulgaris.* Thyme used as corrective in condiments, as anti-wind, especially in cooking yams, pods of oats, cabbage.

Thymol.—Methyl propyl phenol obtained from oil of thyme or synthetically as crystalline solid, almost insoluble in water, m.p. 44°C.; liquifies with camphor and menthol; strong antiseptic; used in surgery and as parasiticide.

Tin Ashes.—Powdered tin stone.

Tinctures.—Alcoholic extracts of medicines, prepared by percolating alcohol slowly through the drug, or by straining the alcohol in which the drug has been steeped for several days, or making a solution straight. For various *Tinctures* See Part I, p. 392.

Tinning.—The art of covering another metal with a surface of tin. It is performed as follows:—*To tin copper or brass:* Boil 6 lbs. of cream of tartar, 4 gallons of water, and 8 lbs. of grain tin. Put in the articles to be tinned, and continue boiling until they are sufficiently covered. *To tin iron:* First make it bright, then soak it in an acid, such as sour whey, sour grains, or something similar; rub it over with sal ammoniac, and dip it in melted tin. Saucepans, &c. of copper are first well cleaned; then melted tin and sal ammoniac are put into them; then put on the fire, and

when the tin is melted they are turned about until a thin film of tin adheres.

Tin White.—Stannic hydroxide.

Tinospora Cordifolia.—*Gilo, gulancha.*

Tolu, Balsam is obtained from *tolui fera balsamum*, a tree which grows in S. America.

Tonka Bean.—A fruit with fragrant kernels.

Topaz.—A gem or precious stone of yellowish, or sometimes of rose red colour.

Tragacanth.—*Kateera gond*, katila or Gum Dragon, from certain Asiatic trees ; swells up on macerating in water and used as cooling agent along with faloodah ; used in making mucilages and in calico-printing ; also called gum adracant and gum dragon, is the produce of *Astragalus tragacantha*, and some other shrubs. It is firm, rather heavy, tough, and difficult to powder, unless previously heated ; of a pale, yellowish white colour, sometimes brownish ; has no smell, and but little taste ; dissolves in water very slowly, and becomes mucilaginous. It is used chiefly by confectioners to make gum paste, to harden lozenges, &c., ; also as a dressing or stiffening material to some textile fabric. B. Astragalus Heratensis.

Treacle.—*Sheera, rab.*

Tricolepsisnio.—*Untkatara ushtar khar.*

Triple Salts.—Neutral salts, into the composition of which three substances enter. For example, common alum is a triple salt of alumina, potash, and sulphuric acid. Its proper name is, therefore, the sulphate of alumina and potash.

Tripoli.—Rotten stone, and earthly mineral, composed of skeletons of insects, used for grinding and polishing.

Triturate.—To rub or grind to a fine powder.

Trona.—Natural sodium carbonate.

True Gum Arabic.—B. Acacia senegal, wild : *Khor. See Gum above.*

Tuberose Oil.—The oil from the flowers of *Shabbu phul (gul-i-shab, rajni, gandh pushpa, kenhyaghas, kamini etc.)*

Tungsten.—A white hard grey heavy metal found in Sweden, U S. A , Burma, and Australia, or from *wolfram* and *scheelite* ; sp. gr. 19 : m.p. 3,000° C., used in high-speed steels, tools containing 14 to 18% of the metal retaining their edges even while turned red hot; is used in making filaments of incandescent lamps, the use of metal being superior to carbon and much cheaper than platinum.

Turkey Red Oil.—Sulphuretted castor oil.

Turmeric.—Yellow dye from dried and ground rhizomes growing in India, China, Goa etc. Used in condiment, and for making dyes, and in making test papers. Turmeric turns deep red with any alkali. Ver. *Haldi.* B. Curcuma Lionga.

Turnbull's Blue. Ferrous ferricyanide, prepared by the action of a ferrous salt on potassium ferricyanide ; properties almost those of Prussian blue.

Turpeth.—*Tirvi, Turbad, Nisot, Teiri mool.* B. Ipomoea Turpenthum, R. Br.

Turpentine.—*Gunda behroza,* exudation from pine, on being distilled by heat or steam yields oil of turpentine, the residue left being colophony ; resin or rosin. Oil pale yellow or colourless, used as a drying agent in making paints and varnishes of resins and gums. Russian turpentine does not dry properly. Oil boils at 160° C. Used as counter-irritant and rubifacient.

Turquiose.—Callaite, *neelam*, an aluminate, a sky-blue precious stone, from Neshapur in N. Persia.

Tylophora Ashthmatic, *Rasan.*

Type Metal.—For the casting of ordinary large type, the founders use an alloy of 3 parts lead and 1 of antimony, though the composition varies from $\frac{1}{3}$ to 1/80 of antimony. For smaller type may be used 9 lb. lead, 2 lb. antimony, and 1 lb. bismuth. This last alloy expands in cooling. The less the ratio of antimony, the more brittle the types.

Urea.—A substance which forms part of urine. This and uric acid, which is urea united with oxygen, contains proportionately, more nitrogen than any other animal substance.

Ultramarine.—A beautiful blue colour, used by painters, and prepared by calcination from Lapis lazuli. The genuineness of this article may be proved by putting a portion into an iron ladle, and if when the ladle becomes red hot, the paint retains its colour, it is unexceptionable. This exquisite colour has the virtue of being extremely lasting, perhaps more so than any other blue ever produced.

Ultramarine Yellow.—Barium chromate.

Umber.—Compound of hydrated ferric and manganese oxides, with admixture of clays : used as a pigment, calcined variety yielding a warmer brown pigment. Distinguish from amber which is a fossil resin.

Unblanched.—*Na shushtah ; gair musaffa ; andhoya.*

Uranium.—A metallic element derived from pitchblende, occurring in Cornwal, Bohemia and Colorado. Uranous chloride is reduced with sodium to extract uranium. A hard white metal. Sp. Gr. 18.7 ; m.p. about 1600° C. Lemon-coloured uranic salts having fluorescence prepared from the oxide (UO_3). Uranium and its salts emit rays which have photographic action, discharge electroscope, and render phosphorescent substances luminous, effects probably due to presence of uranium. Uranium used in steel alloys ; compounds "yield a canary-yellow fluorescent glass, a black pigment for China painting and reagents for photographic purposes."

V

Valerian..—(*Kuth*), fragrant root obtained chiefly from the lower heights of the Himalayas, largely used in painting the holds of the ships. Tincture Valerian is prescribed in epileptic fits. Valeric acid is used in preparing fruit essences.

Vanadium.—A rare metallic element ; grey and very fusible metal ; m.p. 1680° C. ; sp. gr. 5.5 ; increases hardness and malleability of steel ; forms several oxides, the higher ones yield vanadic acid, which with the vanadates, are used in making aniline black and for colouring glass.

Vanilla.—A creeping plant allied to *saleb misri*. An aromatic fluid extracted from the pods of *vanilla planifollia*, used for flavouring.

Vanillin.—A methyl ether.

Varnish.—A clear limpid fluid, capable of hardening without losing its transparency; used by painters, gilders, canmakers, &c., to give a lustre to their work, to preserve them, and defend them from weather. The properties of a good varnish are that it shall become quite hard, not crack, become discoloured, nor lose its lustre by time, lay upon the work in an even coat, not be affected by water or a damp atmosphere, and not alter the colours over which it is applied. The base of all varnishes are the various resins, which are soluble in fixed oil; volatile oil, of which spirits of turpentine is mostly added to the oil to produce sufficient fluidity. The spirit or alcoholic varnishes are the following:—*White spirit varnish* (see Sandarac); *cabinet maker's varnish,* made of pale shell lac, 750 parts; mastic, 64 parts; alcohol, 1000 parts by measure. It is made cold, and is easily injured by heat and spirituous liquors spilt on it. *Golden varnish*: Gum lac in grains, 25 parts; gamboge, 25 parts dragon's blood, 25; annatoo, 25; saffron, 6 parts. Strong alcohol to be added till sufficiently thin. Mastic or picture varnish, (see Mastic). *Crystal varnish* is made of Canada balsam and spirits of turpentine mixed together when both are warm. *White hard varnish*: agitate together in a large tin bottle, 2½ lbs. of gum sandarac and 1 gallon of spirit of wine, when dissolved it will be fit for use. *Brown hard varnish*: agitate together till dissolved 1½ lb. shellac and 1 gallon alcohol. *Oil varnishes*:—Turpentine varnish is made with common rosin, boiled in linseed oil and diluted, with spirits of turpentine. *For copal varnish,* (see P. 157.) *For amber varnish*: Take 8 oz. of amber, coarsely powdered, 1 oz. of venice turpentine, 5 ozs. of linseed oil and 8 ounces of spirits of turpentine; boil the amber in the oil, and then add the turps. *For a black varnish,* (see Brunswick black). *For a varnish for tin and brass ware,* (see Lacquer). *For Balloon varnish,* (see Caoutchouc.)

Vaseline—A proprietory name for a jelly left on distillation of petroleum; highly plastic; insoluble in water; used as protective of steel from moisture;

enters largely in the composition of ointments and cosmetics.

Velleriane.—*Badranjboya, Balchhar.*

Veleriana Celtica.—*Tagar, sugandh bala, Asaroon.*

Venetian Red.—Ferric oxide.

Venice Turpentine, Canada Balsam.—Obtained from larch, a kind of cedar. It is a mixture of resin, turpentine, and linseed oil.

Verdigris.—*Zangal, zangar ;* acetate of copper, used in preparation of some green pigments ; highly poisonous, hence copper and brass vessels should be occasionally tinned.

Vermicelli.—*Simian sewian;* worm-like threads made from wheat-paste. See P. 16.

Vermillion.—An extremely bright and beautiful red colour, composed of quicksilver and sulphur, in great esteem as a body colour, and held equally in esteem by the ancients, under the name of minium, (the minium of modern times is red lead). There are two kinds called English vermillion ; and the Chinese vermillion, which last is more finely ground, and of a more brilliant colour *Shingraf ; Kunkum.*

Vetivert.—Vetiveria Zizanoides, Staff. *Cus Cus, Khas-Khas, Khas.* See Vitivert below.

Vinegar, (*sirka*), dilute solution containing 3 to 6% acetic acid. See P. 142.

Vinegar, Salt.—Calcium acetate.

Violets.—(*gul banafsha*) ; white, blue or purple flowers growing in the Himalayas ; used in medicine as demulcent and mild aperient, also to make a refreshing syrup.

Vitex, Nirgundi.—*Sambhaloo.*

Vitivert.—*Khuskhus,* root ; grows in ponds ; distilled water makes a refreshing drink with sugar ; otto possesses rather too strong a smell ; Khus tatties and Khus fans afford relief in hot weather, used in making many compound perfumes.

Vitriol.—See Sulphuric acid.

Vodka.—Russian brandy; harsh, noxious, fiery spirit, prepared mainly from rye, but also from barley, oats, and rye mixed.

Vulcanized.—Rubber treated with sulphur at high temperature to increase its strength.

Wafer.—A thin pasty material; used to close letters, and stick other smaller articles together. Wafers are of four kinds. *Paste or common wafers*, which are made of wheat flour and water, with some colouring matter. The thin fluid paste is poured on a square iron frame, made of a very little depth; a second frame or rather cover is put over it, which squeezes out the superfluous paste and being warm, the iron at the top and bottom bakes the paste into a thin cake, which is afterwards punched out into form. Second, *transparent wafers*, which are made of fine glue, poured out on to a marble slab, when cold and dry, it is punched out with proper shapes. Third, *gum wafers*, lately much used, are merely coloured paper, gummed on the blank side, and cut out with a stamp that at the same time impresses them with a device or letter. Fourth, *medalion wafers*, for these, dies with various devices are taken; a mixture of flake white or ceruse is painted over the depressed portions of the die; the superfluity of this is wiped off with the hand, and dissolved isinglass afterwards poured over the whole. When dry, and taken off, the wafers present the appearance of a white figure upon a different coloured ground.

Walnut.—*Akhrot*, a Himalayan tree: when the fruit is ripe, the kernel is edible, but contains an essential oil that irritates sensitive throats; unripe nuts make pickles and ketchups; bark of tree used as *dandasa* or rouge by ladies, wood light, beautiful marking, free from splitting and warping. Two main varieties *Bhurju*, largely used as Indian billiard balls.

Washing Soda.—See Sodium Carbonate.

Water Bath.—Water boiling in a kettle, used for evenly heating substances below 100°C. *cf.* Sand Bath above.

Water Colours.—Such pigments as are miscible with water; these are usually sold in small rectangular cakes, made by grinding the proper pigment along with

water until it makes a uniform paste ; to this a little size is added, and then a portion of it, sufficient for a cake, is pressed into mould, which has been slightly oiled ready to receive it.

Water Cress.—(*Halyon, naksari Pb. Halon*), a herb with acrid taste and pungent smell ; stomachic ; makes a good *chutney*.

Water Glass.—*Soluble Glass*, sodium silicate, formed by fusing silica (sand or flint) with sodium carbonate or with Glauber's salt and carbon, the products being extracted with water. Used for preservation of eggs and for manufacture of artificial stone ; mixed with clay for lining furnaces ; in fireproofing and in manufacture of soap.

Water, Hard.—Water which lathers with difficulty on addition of soap solution e.g., calcium or magnesium chloride water. These are bad for clarification of syrup, for boiling pulses in and for laundry purposes.

Water of Crystallization.—Many salts require a certain proportion of water to enable them to retain the crystalline form, and this is called their water of crystallization. Some retain this so feebly, that it flies off on exposure to the air, and they fall to powder. These are the efflorescent salts, e.g., Epsom salt, blue vitriol, green vitriol. Others have so great an affinity for water, that their crystals attract more from the air in which they dissolve. These are the deliquescents.

Water, Soft.—Water which lathers easily with soap solution. Such waters are useful for boiling pulses in, for clarification of syrup and for laundry purposes.

Wax Mineral.—A bituminous substance, found at the foot of the Carpathian mountains, near Slarick.

Wax Myrtle.—*Kaiphal*.

West Indian Arrowroot, Ararot.—B. Maranta Arundinabe.

White Acid.—Hydroflouric acid and ammonium fluoride.

White, Arsenic.—Arsenious oxide.

Witharia, Sormifer.—*Asgand*

White Lead.—Basic lead carbonate, a mixture of lead carbonate and hydrated lead oxide ; a soft, heavy,

earthy powder; used in pigments; very poisonous; blackened by hydrogen sulphide.

White Vitriol.—Zinc sulphate.

White Zinc.—Zinc carbonate.

Whiting.—Chalk cleared of its grosser impurities, ground in a mill, mixed with water made up into small loaves, and dried; pure chalk. *musaffa or shudh kharya.*

Winter Cherry.—*Aswagandha*. B. Witharia Somnifera.

Wild Tobacco.—*Dhavala jungli tambakoo;* B. Liolialm Nicotian Asfolia.

Witherite.—Barium sulphate.

Wood, Staining of.—To give a colour to the surface of wood, different from that it naturally possesses, the object of which is to make it resemble other woods of a more ornamental character; thus beachwood bedsteads are stained of a reddish purple by passing over them a brush dipped into a solution of archil, which is improved by an after-wash of a solution of pearl-ash. For *a black stain*, add 1 ounce of pearl-ash to 8 ounces of logwood, in chips; boil them together in 2 quarts of water, and apply hot with a brush; when dry, brush it a second time with a solution in quart of water, of I ounce of blue stone, and 2 ounces of copperas. *To stain beachwood like mahogany,* wash it in a solution of dragon's blood in sprits of wine, or a solution of alkanet root; this will also darken mahogany. To accomplish this latter purpose, so as to make the mahogany very dark, wash it with lime water.

Wood Alcohol,
Wood Naphtha, } Methyl alcohol

Wood apple.—*Bengal Quince Sriphal, Lilvaphal, kotori, Bilgiri, Bil Katha.*

Woolfram.—A mineral mined along with tin from Cornwal, Burma, U. S. A., colour reddish brown to black; hardness 5; sp. gr. 7.5; yields tungsten.

Winghtia tinctoria.—*Inderjau.*

Writing Ink and Fluid.—May be of various colours A good black is, however, the most essential. The following receipts for that and other colours are recom-

mended :—*Black* :—for a gallon, take 1 lb. of nut-galls, bruised ; 6 oz. of green vitriol ; 6 oz. of gum senegal, or Arabic ; and 1 gallon of water. The galls to be boiled, and then left to settle. The clear liquor to be added to the vitriol and gum. *Japan Black Ink* : green vitriol is first calcined ; the ink is blacker, but not so durable ; more gum is added than to ordinary ink, and sometimes sugar also. *Red ink* is made by boiling Brazil-wood in vinegar or water. Logwood makes it darker coloured. *Yellow, green blue, and other coloured inks* are made by the infusion of gamboage, sap-green, sulphate of indigo, or other pigments. An ink, called *Stephen's writing fluid*, is said to consist of a tannogallate of iron and the sulphate of indigo combined. To make it, boil together nutgalls, indigo, and green vitriol. See also Part I, p. 215.

Xanthine.—A nitrogenous compound, extracted from meat extract or tea, allied to uric acid ; forms colourless powder ; slightly soluble in water.

Xanthophyllum.—*Tejbal, Tejphal. Kabab-i-dahan*.

Xenon.—The densest inert gas of the argon family.

X-Rays.—See Rontgen Rays.

Xylenes or Xylols—Derivatives of coal-tar, almost similar to benzene but have higher boiling point 138° to 143° C., sources of some dyestuffs.

Xylonite.—See Celluloid.

Yams.—*Kachalu*,, *arvi*, edible tuberous roots ; make palatable and nutritious dishes.

Yeast.—*Khameer*, a yellowish frothy substance consisting of fungus cells produced in fermentation.

Yellow Prussiate of Potash.—Potassium ferrocyanide.

Zinc or Spelter.—Metallic element resembling magnesium ; sources, calamine (zinc carbonate) and zinc blende (zinc sulphide) mined in Austria and U. S A. Ores are roasted to oxide which on bing reduced by carbon, the metal distils over or is dissolved in acid and extracted by electrolysis. The metal has bluish-white colour ; is brittle ; can be rolled into leaves at 100° C to 150° C., can be powdered at 250° C. ; sp. gr. 6.9 to 7.2 ; m.p. 419° C. ; b. p. 918° C., burns with

bluish white flame with the formation of zinc oxide; soluble in dilute and strong acids and caustic soda; hydrogen being given off in each case; slowly tarnished by moist air with the formation of basic carbonate, Alloys; brass, galvanized iron with aluminium for air ships used in desilvering lead, for rods of electric batteris, for precipitating gold, as reducing agent.

Zinc Chloride is formed by the action of chlorine or hydrochloric acid by heat; wax-like, used as a dehydrator, and for weighing cotton; solution dissolves silk.

Zinc Oxide.—*Kushta jist : phuka hua jist ; malhi,* used as pigment and in medicine.

Zinc Phosphide is obtained by the direct combination of zinc and phosphorus by heat.

Zinc Suplphate.—See Sulphate of Zinc.

Zinc Sulphide.—A white powder, obtained by the action of sulphuretted hydrogen on any zinc salt, e.g., zinc sulphate.

Zirconia.—A rare earth, extracted from the zircon; it is an oxide of zirconium, a substance possessing externally, none of the metallic characters, but rather resembling charcoal powder, which burns briskly, and almost with explosive violence.

Zizypher.—*Ber, Berjhari, Kanar.*

For detailed manufacturing hints for the manufacture of most of the chemicals described above, study Industrial Chemistry. One such to which we are indebted for the amplication of the current edition is "Industrial and Manufacturing Chemistry, by Geoffrey Martin. Published by The Technical Press Ltd., 5, Ave Maria Lane, Ludgate Hill, London, E.C.4.

PART V

EQUIVALENTS

OF

INDIGENOUS DRUGS Etc.

IN ENGLISH

Hindustani Drugs with Equivalents in English.

A

Abnoos, *Ebony.*
Abraq, *Mica,.*
Abbhal, *Juniper; juniperus communis.*
Adrak, Ginger.
Afeem, Opium.
Afsanteen, Artenmisia Indica.
Afteemun, Dodder.
Agar, *Aguru* Eagle wood, Aloewood, Aquillari, Roxb, swallow wort.
Agar Batti, Incense.
Ajmod, Parsley; opium invalucreta.
Ajwain, Dill Seed, Carum Copticum, Thyme
Ajwain Khurasani; Henbane
Ak, Madar; Calatropis gigantae.
Akanda; Akarkara, see AQarqara
Akhrot, Walnut.
Akleelul Malik, Sweet Cloves, Hyosymus Niger.
Aknadi, India Pareira Brava.
Al Akseer, Elixir
Al Kusi, See Kamchi.
Almas, Adamant.
Alsi, Linseed.
Alu Balu, Cherry.
Am, Amua, Mango.
Amarbel, Dodder.
Aml-i-Taqtir, Distillation.
Amaltas, Amalthus; Purging cassia; Indian laburnum, Cassia fistula
Ambar-i-Ashbab, Ambergis.
Amla, Myrabolan.
Ananas, Pine Apple.
Anâsar, Elements.
Andhoya, Unblanched.
Angoor, Grape.
Angan, Galena.
Ankol, Ankot, Alangium acku.
Aphim, Aphyoon, Opium.
Aqarqara, Pyrethurum; pellitory root; Anacyclus Pyrtherum Dc.
Aqeeq, Agate.
Ararot; East Indian Arrowroot.
Areetha, Saponium; soap nut.

A—*contd*

Arjuna, Terminalia arjuna.
Arhar, Cajanus Sativa; Pigeon pea.
Aroosa, Adhatoda vasica, Bakes, vasaka.
Arraq, Spirit.
Aru, Peach.
Arvi, Yams, Arum.
Asal Asoos, Extract of Liquorice.
Asaroon, Veleriana Celtica.
Asgandh, Wilhavia Somnife.
Ashok, Saraca indica.
Ashrafi Phool, Marigold
Ashwa Gandh, Winter cherry, Wilhamea Somnifera.
Asl, Honey.
Asmak, Sweet Cloves.
Asoos, Liquorice,
Atees, Aconite, Aconitum heterophyllum, wall
Atibish, See Atis.
Awan Haldi, Berberies.
Ayurbal, See Abbhal.

B

Babla, Babul, Acacia.
Babul, Indian gum arabic tree; Acacia Arabica Wild.
Baboona, chamomille.
Bach, Orris Root, Acarus Calamus, Sweet flag.
Bachnag, Aconitum Spicatum stapfm.
Badam, Almond.
Badariqand, Batatas peniculate
Badranjboya, Valleriana.
Badrulbhanj, Henbane; Hyosy.
Baebrang, See Biranga.
Bael, Bil, Bael Fruit, Aeglemar melos
Bagarbhang, Henbane.
Baggu Gosha, Nectarine.
Bahman (Surakh or sufaid), Centauria Behman; Salvia Hae.
Bahroza, Rosin.
Bahera, Terminalia Balerica.
Balungu, Dracocephalus.
Bakum, See Patang.

B—*contd*

Bakyan, Persian Lilaec.
Balsams, Resins.
Balsan, Balsam.
Ban, Bana, Oak.
Bansalochan, Bamboo pith, bamboo manna
Band gobhi, Cabbage.
Bankakri, Mandrake
Ban Tulsi, Marjoram.
Banwangan, Mandrake, padophylum Emodi.
Baobaring, Embelica.
Baqla, Broad Bean.
Barg-i-Jauzboa, Bay leaf.
Bara Elaichi, Greater cardamom.
Bara-Kulinjan, Greater Galangal; Alpina Galanga, Wild.
Bathwa, Cheropodium.
Bauphali Cochurus humilis.
Bazrul katan, Linseed.
Bawchi, Psoralea Corylifolia.
Bed, Pakhan Bed, Gentian.
Bed mushk, Selix Capria.
Behroza, Katel, Copaiba.
Ber gol, Bersurakh, jhariber, Zizyphus.
Bhabka, Retort
Bhalawa, See Bhela
Bhang, Cannbis Sativa
Bhangra, Eclipta Prostrata.
Bharangi, Clerodendron.
Bheemsaini Kapour, Dryobalon paramaticus.
Bhela, Marking nut, semecarpus anacardium.
Bhigona, Macerate
Bhoursak, Calamine.
Bhurjapatra, Bhojpatra, Betula Bhojaputrica.
Bijasar, Indian Kino, petero carpus marsupiam.
Bijora, Shaddock
Billilotan, Rushes.
Biluaphal, Bengal Quince, wood apple.
Binole-ka-tel, Cotton-seed-oil
Biranga, Embelia robusloc. Roxb.
Birbohti, Cochineal.

B—*contd*

Bisfaij, Olibanum.
Bol, Murmaki, Myrrh.
Boonden, Mm., Minums.
Brahmi Booti, Indian Pennywort.
Brinjal; Fruit of egg plant.
Brinjasaph, Artemisia Indica.
Buchki, See Bawchi.
Bujha hua choona, Slaked lime.
Burada Ahan, Iron Filings.

C

Chab, Pinus chevya.
Chak Khair, gambier, pale Catechu, Unceria gambier.
Chakodre ka Tezàb, Citric acid.
Chalgozas, Pine cones.
Chambeli, Jasmine.
Chandan, Sandalwood, santalines album
Chandan Lal or surakh, Petrocarpus santulines.
Chandras, Gum Copal, juniper-gum.
Chaqmaq, flint.
Charaurji, Buchanama latifolia.
Chashma-i-kharoos, Abrus precotorius.
Chaulmoogra, Taraktogenos Kurzii.
Chhanna hua, strained.
Chhan-na, percolate.
Chhail Chhabeela, Chhareela, Lichen Oderiferous.
Chhatim, Ditabark; Alstonia Scholaris, R. Br.
Chhatris, Mushrooms.
Chini Mitti, Kaolin.
Chitrak, Plumbago,
Chhui mooyi, Sensitive plant.
Chob Chini, Sarsaparilla; china root, smilax china, smilax glabra.
Chobha, Lucille.
Chohore, angelica; Angelica Glauca, Edgew.
Chhoti-elaichi, Lesser cardamom, Cardamom minor.

C—*contd.*

Chirella, Sweetia chirella.
Chukay, Chevicaofli.
Chulai, Amyranthes-spin.
Chuneka Pani, Limewater.
Chuneka Pathar, Lime stone.
Chuna, Lime.
Cus-cus, See Khas.

D

Dahar-Karanja, Karanja; pongamia Glabra.
Dal Chikna, Corrosive sublimate
Dal chini, Daruchini, Cinnamon; Cinnamomum.
Dandandana, Emetics.
Darchab, Piper chevyen.
Dar filfal, Piper root.
Deodar, Devdar, Pinus deodra.
Desi Sharab, Rum.
Dhak, Bastard teak, see Palash.
Dhania, Coriander; coriandum sativum.
Dhatura, Thorn apple.
Dhavala, Wild tobacco; lobelia nicotianaefolia.
Dhavi Gam Anogeissus Latitolia, Wall.
Dhoona Lakh, Dragon's blood.
Dhoya hua, Rinsed.
Dhure ka Tel, Colza oil.
Dhup, Insense.
Diram, Drachm.
Draksh, Grape.
Dudhal, Dandellion, Tarasecum officianale.
Dudh Pathri, Talc, talcum.

E

Esabgol, Fleewort.
Elaichi, Cardamom.
Elaichi Bari, Cardamom major.
Elaichi Chhoti. Cardamom minor.
Elaichidana, Cardomom drops.
Elwa, Aloes.
Erandi kal Tel, Caster oil.

F

Falsa, Grevia.
Filfal Daraz, Peepal, Long pepper
Filfal Gard, Pepper.
Frashbeen, French beans.

G

Gajni, Grey Ochre.
Galgal, Lime.
Ganja, A narcotic derived from cannabis sativa.
Gari ka Tel, Cocoanut oil.
Ganda Behroza, Turpentine.
Gandhak, Sulphur.
Gandhak ka Tezab, Oil of vitriol, Sulphuric acid.
Gandh Rus, Murmaki.
Ganja, Indian Hemp, cannabis sativa, L.
Garjan oil, Garjan Balsam.
Gawazuban, Onosma brac
Gazar, Carrot.
Ghair Musaffa, Unblanched.
Ghorbacha, Sweet Flag, Acarus Calamsu, L.
Ghungchi, Abrus-precatorius.
Ghia Kas, Grated.
Gidder Dakh, Currant.
Gilo, Tinospora cordifolia.
Godanti, White Orpiment.
Golar, Indian fig.
Goonja, Jecquirity, Abrus Precatorius.
Gopichandan, China-clay, Kaolin.
Gond Keekar, Gum arabic
Gorakh Mundi, Spharanthus Office.
Gowara, Oatmeal, oats.
Gudda Bana Hua, Pulped.
Gudha Hua Ata, Dough
Guggal, India Bdeliun commiphora, mukal.
Guladshahi, Epododendron.
Gulancha, Tinospora cordifolia.
Gul Banafsha, Violets.
Gul-i-hawa, Anemone.

G—*contd*

Gul khaira, Flowers of marsh mallow.
Gulmaindi, Balsam.
Gunju, Acarus-precatorius.
Gur, Molasses.
Gurrhal, Shoeflower.

H

Hajra Hajud, Oolite.
Haldi, Turmeric, Curcuma longa.
Halela, Chebula.
Halela zard, Terminelia Bellerica
Halwa Kaddu, Pumpkin.
Halyon, Water Cress.
Hans Padi } Maidex Hair Fern.
Hans Raj }
Hanzal, Bitter Apple, Colocynth.
Harar, Chebula.
Hareetki, Chebula.
Hartal, Orpiment, Sodium Sulphide.
Hathi chak, Artichoke.
Hathjori, Lyopodium; cissus quadrangula.
Heeng, Asafoetida.
Heera, Diamond.
Henna, Myrtle.
Heyoober, Juniper.
Hijli, See Kaju Badam.
Hing, Asafoetida, feruea.
Hingot, Bilanitis.
Hiradokhi, Dragon's blood.
Hira Kasis Copperas, Ferrous Sulphate, Green vitriol.
Hirmachi, Red Ochre.
Hubolas, Myrtus conmuni.
Hub-i-salateen, Croton seed.

I

Imli, Tamarind; see Timer Hindi
Indrajau, Wrightia Tinctoria.
Indrayan kal Phal, Bitter Apple; Colocynth, citruluss colocynthis.
Isabgol, Spongel seeds, plantago ovato
squill, squill.

J

Jalbed, calamus.
Jalkumbi, moss.
Jamalgota, Croton.
Jawar, Large millet; sorghum vulgare.
Jowan, See Ajowan.
Jamon, see kala jam.
Jangli Piyaz, Squill.
Jangli Seb, Crab Apples.
Jangli Tambaku, Lobelia.
Jatamansi, Spikenerd.
Jauash, Malt.
Jauhar Urana, Sublime (Verb.)
Jaukhar, Pearl Ashes, Salt of Tartar, Potash.
Jawatri, Mace.
Jauzalqal, Emelic nut.
Jeera, Cumin; Cuminum Cyminum.
Jhaoo, Tamrik.
Jintiana, Gentian.
Jist, zinc.
Jaiphal, Nutmeg.
Jafran, See zafran.
Julab ka Namak, Epsom salt, magnesium sulphate.

K

Kababa, Allspice, Pimento.
Kabab cheeni, Cubeb.
Kachalu, Yams.
Kacchi kunain, Cinchona.
Kachnar, Bauhiniover.
Kachoor, Nar kachoor, Long zedory.
Kaddu, Pumpkin.
Kafoor, Camphor.
Kaju Badam, Cashewnut; Anacardium occidental, L. cocculus berries.
Kakmari, Cubeb.
Kaknaj, Punceria Coagulans.
Kakol, Cubeb.
Kakronda, Bhumia Lacera
Kaladana, Pharbatis.
Kala jam, Jambul seeds, jambolana.

K—*contd*

Kalajamun, Blackberry.
Kala Sohaga, Aloes.
Kali mirach, Pepper, pepper nigrum.
Kallar, Efflorescence, cf. Fuller's Earth.
Kameela, Mallotus Philippinenis.
Kalmegh, Great, Andrographis Paniculata, Nees.
Kalmi Shora, Salptetre
Kamchi, Cowhage, mucuna pruriens.
Kameela, Rotleria Tinctoria.
Kandoori, Dorerrena.
Kanar, Ammoniacum, zizyphus; nerium odorum.
Kaner, Oleander.
Kangani, Panicum Ital.
Kankar, Quicklime pebbles.
Karahi, See Kaner.
Kaur, Indian gentian.
Kanthal, Jack fruit.
Kantkari, solanum Xanthocarpum.
Kapoor, camphor.
Kapoor Kachri, Hedycymus.
Karanja, See Sahar Karanga.
Karam kala, Cabbage.
Kareer, Caper plant.
Karela, Momordica charantia.
Karu, Hellebore, Connessi bark.
Karaunda, Gooseberry.
Karwa Tel, Rapeseed Oil.
Kasees, Green Vitriol, Copperas.
Kashi Phal, Pumpkin.
Kashniz, Coriander
Kashid Karna, Distill.
Kastoori, Musk.
Kateera, Ketica, Tragacanth.
Katori, Bengal quince; wood apple.
Kathi, See Khair.
Kasni, Endive, Chicory.
Kasumbha, Safflower.
Kasumbhi, Caranthus
Kaur, Hellebore.
Kaureya, see Kurchi.
Kaurtumma, colocynth.

K—*contd*

Kayphal, Wax myrtle.
Keeker ki Gond, Gum Arabic.
Kehraba, Amber.
Kesar, see Zafran.
Khabus-ul-hadeed, Manganese.
Khadar, Catechu
Khair, Acacia catechu.
Khaisandah, infusion.
Khal, Khali, oil cake.
Khavi, Ginger grass; cymbopogou schoenanthus.
Khirni, euphorbiapilulifera Dhudhea.
Kateera Gond, Tragacanth.
Kesar, Saffron.
Khair, Acacia Catechu, Wild catechu tree.
Khasi, Sisymbredummilvid.
Khameer, yeast
Khár, Aklali
Kharal, Mortar
Khari, Glauber's salts.
Kharia Mitti, Chalk.
Khatmi, Aeklae.
Khaulanjan, Galangal.
Kheel Kiya hua, Calcined.
Khetpapara, Oldenlandia corymbosa.
Khira, Cucumber.
Khoob kalan, Sisymbriumilrid.
Khopra, Cocoanut.
Khopare ka, Tel, Cocoanut oil.
Khor, Tru gum arabic, Acacia senegal, Wild.
Khumb, Mushroom.
Khun shaoshan, Dragon's blood.
Khurmani, Apricot.
Khushk Luk, Asphalt.
Khuskhus, Vitivert.
Khyarshambar, Amalthus, Purging cassica
Kikar, acacia, Indian gum arabic tree, Acacia arabica, wild.
Kishmish, Raisins
Kothmir, Coriandar.
Koftah, Minced
Koonch, Jecquirity, Abrus Precatorius.

K—*contd*

Kuchla, Nux vomica; strychnos nux-vomica.
Kundru, Olibanun.
Kulanjan, Galangal.
Kunjad, Sesame.
Kurchi, Conessi; Telicherry bark
Kurund, Corrundum.
Kushta jist, Zinc oxide.
Kutki, Hellebore.
Kuth, Valerean, costus, saussurea lappa.
Kutus, Connessi bark.

L

Lajward, Lapis lazuli.
Lahsan, Garlic.
Lal Hartal, Realgar.
Lal Mirch, Capsicum cayenne pepper.
Lakh, Gum shellac
Lassoora, Cordia major
Lasoorian, Cordia minor.
Latakaranj, Bonduc nut
Lauki-Ghiya, Gourd.
Laung, Cloves; see Luvanga.
Lemun, Lemon.
Loban, Benzoin incense, Benzoin benzamin, styrax benzoin,
Lodh, Symplocos Racemosa.
Lohechoon, Iron filings.
Lotta Sajji, Barilla.
Luab-e-dehin, Ptyalin, saliva.
Luban, See Loban
Lunka, Chillies, capsicum annuna, L, and C Frucscens, L.
Luvanga, Cloves, eugenia caryophyllata, Thumb.

M

Madanphal, Emelic nut.
Madhu, Honey
Madhurasa, Bowstring hemp
Magh. Peepal: Long pepper.

M—*contd*

Mahabari Bach, See Barakulinjan.
Mahua, mowra, Bamaletifolia
Maida Lakri L. Sall. Tetraenuthera Roxbar.
Mael utarne ka zaraf. Skimmer.
Majeeth, Madder.
Maju, Galls.
Mainphal, Emetic nut
Makhion, Honey.
Mako, Soloanuni Indic.
Makol, Gypsum.
Malhi, Zinc oxide.
Malkangni, Calustrus paniculata.
Mameeran, Captus teeta, goldthread.
Manchhal, Realgar.
Mandwa, Oatneal.
Mankachu, Alocasia Indica, Schott.
Manur, Basic slag.
Marorphali, Heliteris Isones.
Reshakhatmi, Marsh mallow,
Marwa, Marjoram
Marwareed, Pearl.
Masha, Drachm, gram.
Masqati, Mastic, gum mastiche.
Mattar, Peas.
Matti ka tel, Petroleum oil.
Meetha tel, Sweet oil.
Mehndi, Myrtle, henna, Lawsoria alba
Methidana, Fengureek, trigonella foenumgraecum.
Mayin, Galls of certain Indian tree.
Mewe ka Beej, Pips.
Mirjan, Red Coral.
Misri (Sitta, Multani or Bikaneri) Rock Candy
Misri tayi ki, Sugar Candy.
Mitha Telia. Aconite, see Bachnag.
Mishmee Toota, See Mamira.
Mohri, Acontlum chasmanthum stapp
Mom, Paraffin, Beeswax.
Momiama. Linoleum

M—*contd.*

Moong, Phaseolus radiatus.
Moonga, Red Coral.
Moong Phali, Groundnut.
Moti, Pearl.
Mudar, Swallow wort
Mufarrah, Elixir, Cordial.
Muktajhuri, Indian acalypha, Acalypha Indica.
Mulethi, Liquorice; see yasthi madhu.
Muli, Raddish.
Multani Mitti, Grey Ohre.
Murda Sang, Litharge; massicot.
Murmaki, Myrrh.
Musabbar, Aloes.
Musaffa Suresh, Gelatine.
Mushk Ambar, Ambergis.
Mushk-bala, Indian valerian.
Muskhani, Asafœtida.
Mustaira, Dona; Artemisia.

N

Nag Bhasma, Lead carbonate.
Nagdaman, } Asparagus.
Nagdaun, }
Nag Kesar, Masua Ferra.
Nakasri, Water Cress.
Nak Chhikni, Hoya verdifolia.
Namak, Salt Common, Sodium Chloride.
Namak ka Tezab, Hydrochloric Acid, Muriatic Acid.
Nargas, Narcissus.
Nashpati, Pear.
Nashasta, Starch.
Nashustah, Unblanched
Naushadar, Sal Amoniac, Amonium Chloride.
Neelam, Turquiose,
Neel, Indigo,
Neelofar, Nuphar; lotus flower.
Neem, margosta, or Margosa melia azadirachta
Neola, Mongoose.
Neoza, Pine cone.
Niazbo, Marjoram.
Nilaphal, Blackberry.
Nila Thotha, Bluestone, Copper Sulphate, Blue Vitriol.

N—*contd*

Nilkalmi, kaladana, impoea hederacea.
Nimbu, Lemon,
Nimbu ka Sat, Tartaric Acid.
Nisaurs, Nisaut, Terpeth Root.
Nare, Calamus.

P

Pad-bahera, Mushroom.
Padambeej, lotus seed.
Padmakh, Aselepias Herbacia.
Pahari Kikar, Acacia.
Pahari Limbu, Citrus medica.
Pakhan or **Pakhan Bed,** Gentia.
Palak ka Sag, Spinach.
Palash, Bastard Teak; Bengal Kino, Butea Froudosa Roxb.
Pandu China Clay, Kaolin.
Paneer, Cheese.
Panmauri, see saunf.
Panna, Emerald.
Panphal, Prickly Pears.
Papaya, Papaw, carica papaya, L.
Parshaoshan, Fern., Maiden's Hair Fern.
Patang, Sappan wood; caesalpinia sappan, L
Pathani Lodh, Symplocos Racemasa
Patthar, Ber, Oolite.
Para, Parad, Mercury, Quick Silver.
Patraj, Cinnamon leaf, Bayleaf.
Peeli Mitti, Yellow Ocre.
Peepal, Long pepper. Piper longum.
Peshabawar, Diuretic.
Pitarseli, Cellery Seeds.
Peori Walaiti, Chrome Yellow.
Petha, Pumpkin.
Phuka hua jist, Zinc Oxide.
Phal Godne ka Kanta, Lucille.
Phitkari, Alum.
Phool, Gandhak, flowers of Sulphur.
Phool Gobhi, Cauliflower.
Phulahi, Acacia.

P—*contd*

Pista, Pistachio.
Pital, Brass.
Pitpapra, Fumania Paraviflore See also Khetpapra.
Pohkarmool, Piper root.
Podina, Mint.
Poni, Skimmer.
Post, Poppy.
Puna hua, Strained.
Punarnava, Hogweed, Boerhavia Repens, L.
Pungi, Betal nut.
Pushkar Mool, Piper root.

Q

Qariz, Acanthum hirtum.
Qatre, mm, minums
Qima kiya Hua, Minced.

R

Rab, Molasses.
Ral, Pitch, resin ; Resin pitch.
Rasan, Tylophora Asthmatic.
Rasaunt, Berberis extract.
Ras Kapour, Corrosive Sublimate.
Ratanjot, Alkanet.
Reh, Fossil earth, fuller's earth ; Caliche.
Rehan, Marjoram.
Reond, Rhubarb ; rheum emodi.
Resha Khatmi, Marsh mallow ; althaea offacianalis.
Rogan-i-Bed Anjir, Castor oil.
Regmahi; Skunk; Lacerta Cenice.
Rogan-e Gule Shah, Tube rose oil.
Rogan-e Gandh Pushap, tuberose oil.
Rogane kamini, Tuberose oil.
Rogane Kenhyaghas, Tuberose. oil.
Rogane Kunjad, Sweet oil.
Rogane Moongphali, Arachis oil.
Rogane Narjeel, Cocoanut oil.
Rogane Ranjni, Tuberose oil.
Rogane Shabbu Phul, Tuberose oil.

R—*contd*.

Roomi Mastaki, Mastic, mastiche.
Rosha, Rusa Grass, E. I. geranium ; c y m b o p o g o n martina.
Rayeei, mustard.

S

Safed Bish, Aconitum deinor, rhizum, Stapf.
Sabza, Emerald.
Sadaphal, shaddock.
Sagandh Bala, Veleriana Celtica.
Saindoor, Red lead.
Sajji, Barilla.
Sajji Mitti, Fuller's earth.
Sakhat chhilka, Rind.
Sakmonia, Scammony.
Salajit, Storax ; liquid storax ; Liquid amber orientalis.
Saleb, Salop.
Sama Arabi, gum arabic.
Samundra Sokh, Salvia Plebia.
Sadaf, Oyster.
Sadbarg, Marigold.
Safarjal Hindi, Bael fruit.
Sal, Shorea robusta.
Saliagond, Indian olibanum ; Boswellia serrata Roxb.
Sambhaloo, Vitex Nigundi.
Samamundra Jhag, Sea foam, meerschaum.
Samulphar, Arsenic.
Sanamaki, Indian senna, Cassia augustifolia.
Sandal, Sandalwood.
Sang Bhata, Talc, talcum.
Sange Jarahat, Talc, talcum.
Sange marmar, Marble.
Sange Martees, Amethyst.
Sankhia, Arsenic.
Santra, Orange.
Santre ka Araq, Aqua auranti floris.
San, Hemp.
Sana, Senna.
Sapistan, Cordia.
Sarad Chini, All spice ; pimento.

S—*contd*

Sarphoonka, Goat's Rue.
Sarson Indian colza.
Sat Kuchla, Strychnine.
Sat Loban, Benzoic acid.
Satamooli, Asparagus.
Satawar, Asparagus Racemosa.
Sat Nimbu, Tartaric acid.
Sat Podina, Menthol.
Sat-i-qahwa, Caffeine.
Sat-Sharab, Alcohol, ether.
Saugi, Raisins
Saunf, Aniseed ; fennel ; foeniculem vulgare.
Sauranjan, Colchicum daffodilla
Sazaj, Cinnamon leaf, Bay leaf
Sowa, Dill , peucedanum Graveoleus
Seb ki Sharab, Cider.
Seemab, Mercury, Quicksilver.
Seep, Oyster.
Seesa, Lead.
Sel Khari, Talc, Talcum.
Sem ki Phali, Beans.
Sendhur, Minium, Red Lead ; Lead Tetroxide.
Senjna Horse-raddish.
Sennamaki, Senna.
Sewian, Vermicelli.
Shaftalu, Peach.
Shah Dana, Cherry.
Shahtara, Fumania Parviflore.
Shahtoot, Mulberry,
ShailPushpa, Lichen oderiferous
Shahtraj, Plumbago,
Shalmali, Kapok, Silk Cotton Tree
Shakar Qandi, Sweet Potato.
Shahaqal misri, Asparagus racemosa.
Sharifa, Custard Apple.
Sheera, Treacle.
Sheesham, Sisso, Indian Tallow Tree.
Sheetalcheeni, Cub.b,
Shehd. Honey.
Shilaras, Storax.
Shingraf, Cinnabar, Vermillion.
Shora Kalmi, Nitre, Saltpetre.
Shore ka Tezab, Nitric Acid.

S—*contd*

Shore Zamin, Fossil Earth, Fuller's Earth. Caliche.
Shusta, Risned.
Siah-jira, Indian caraway ; carum bulbocastaneum Koch.
Sibar, Alœs.
Silara, Celery Seeds.
Simbal, Kapok, Silk Cotton Tree.
Simbal ka Drakht, Narmah.
Simian, Vermicelli.
Siriphal, Bengal quince, woodapple.
Siras, Sareesh, Sarreenh, Ablizzia Lebboc.
Sirka, Vinegar.
Sirke ka Tezab, Acetic Acid.
Sita Phal, Custard Apple.
Soda Khurdani, Bicarbonate of Soda.
Sona makhi, Iron pyrite.
Sondal, See Amaltas.
Sonth, Ginger.
Soya, Dill Seed.
Sufaida, Lead carbonate
Sufedi, Lime.
Suhaga, Borax.
Suhage Ka Tezab, Boric acid.
Suhanjna, Horse raddish.
Sulfa, See Sowa.
Sulekha, Cinaomaroma.
Sundras, Colophony, juniper gum, Gum Copal.
Supari, Betelnut, areca Catechu L.
Suraj Mukhi, Sunflower.
Surakh kahi, Potassium Bichromate.
Suresh, Glue.
Surinjan, Meadow saffron.
Suresh mahi, Isinglass.
Surma, Antimony, Galena.

T

Tabasheer, Bamboo Pith.
Tagar, Vellerianaceltica.
Taj, Cinnum aroma, see Dalchini.
Talees Patra, Texus Boccatar
Talhi, Sisso, Indian Tallow Tree

T—*contd*

Talmakhana, Euryale, Hygrophy Spinosa.
Tamar, Tamba, Copper.
Tare Mire ka Tel, Rapeseed oil, Colza oil.
Tatvas, Elements.
Tayi ki Misri, Sugar Candy.
Tejpat, Bay Leaf, Cassia, Cinnamon leaf
Telni makhi, Cantharides.
Teorimool, Turpeth.
Tejbal, **Temru,** Xanthaphyllum.
Tentul, See Timar Hindi.
Thohar, Cactus.
Thom, Garlic.
Thook, Ptyalin, Sputum.
Thulkuri, Indian Pennywort.
Til, Sesame, Gingele.
Tili ka Tel, Sweet oil.
Timar Hindi, Tamarind; tamarindus indica.
Tipari, Gooseberry
Tirvi, Turpeth Root.
Triphla, Three myrobolans.
Toriye ka Tel, Rapeseed oil
Tootia, Blue stone.
Tootia karmani, Calamine.
Tukhmalangan, Dracocephalus
Tumma, Bitter Apple, colocynth
Tun, Indian mahogany
Turanjbeen, Manna
Turbad, Turpeth Root.

U

Ud gharqi, Eaglewood,
Ulat Kambal, Devil's cotton; Abroma Augusta.
Unab, Jejube.
Unbujha Choona, Caustic lime, Quick lime, unslaked lime.
Unt katara, See ushtarkhar.
Ushba, Sarsaprilla, chinese root,
Ushtarkhar, Tricolepsismo.

U—*contd*

Ustakhdoos, Lavendula Sloe.
Uttangan, Acanthum Hirtum.

V

Vajraqand, Colchicum duffordi.
Van, oak.
Varkiya Hartal, Orpiment
Vijayasar, Dragon's blood.

W

Walaiti, Mako, Cherrry.
Wish, A poison, Arsenic.

Y

Yakuti, Elixir.
Yashthi, madhu, Liquorice; glycerophyza glabra.
Yeshab, Yeshm, Jasper.
Yasmeen, Jasmine.

Z

Zabarad, Jasper.
Zafran, Saffron; crocus sativus.
Zaharmahi, Cocevlus.
Zaharmohra, Bezoar.
Zaitun, Olive.
Zameen, Base.
Zameen-qand, Arum campanula; elephant's foot.
Zamurrad, Zabarzad, Emerald.
Zanjbeel, Ginger.
Zangar, Malachite, verdigris, blue verditer, copper acetate.
Zaranbad, Long zedory
Zaravind, Aristolochia Indica.
Zardak, Carrot.
Zarishk, Currant.
Zarnab, India pennywort.
Zira, Cummin seeds.
Zira Shah, Caraway; carum-indicum; fennel seeds.
Zufa, Hyssop.
Zoofa,

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Letter D in place of a page means consult Techno-Chemical Directory Part-IV, beginning with page 441.

C